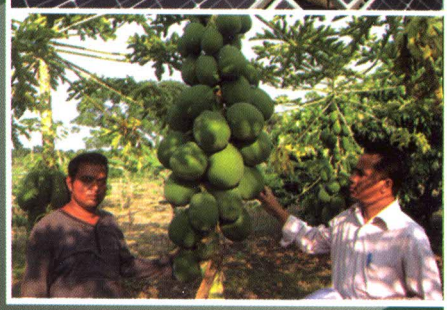
Annual Report 2012-13



বাংলাদেশ কৃষি গবেষণা কাউন্সিল
BARC

Bangladesh Agricultural Research Council

National Agricultural Research System (NARS)

Institute	Ministry	Areas of Research
Bangladesh Agricultural Research Council (BARC), Dhaka	Agriculture	Strengthen the national agricultural research capability through research planning, coordination, integration and resource allocation
Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur	Agriculture	Basic, applied and adaptive research on cereals (other than rice), pulses, oilseeds, vegetables, horticultural crops etc.
Bangladesh Rice Research Institute (BRRI), Joydebpur, Gazipur	Agriculture	Basic, applied and adaptive research on rice
Bangladesh Jute Research Institute (BJRI), Sher-e-Bangla Nagar, Dhaka	Agriculture	Basic, applied and adaptive research on jute production and utilization
Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh	Agriculture	Application on nuclear technology in agriculture
Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna	Agriculture	Applied and adaptive research on sugarcane
Soil Resource Development Institute (SRDI), Farmgate, Dhaka	Agriculture	Soil survey, soil classification and soil characterization
Cotton Development Board (CDB), Khamarbari, Farmgate, Dhaka	Agriculture	Research and training on sericulture
Bangladesh Fisheries Research Institute (BFRI), Mymensingh	Fisheries and Livestock	Marine and freshwater fisheries research
Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka	Fisheries and Livestock	Basic and applied research on cattle, buffalo, sheep, goats, poultry, duck, etc.
Bangladesh Forest Research Institute (BFRI), Sholashahar, Chittagong	Environment and Forests	Forestry and agroforestry research
Bangladesh Tea Research Institute (BTRI), Srimangal, Moulvibazar	Commerce	Applied and adaptive research on tea
Bangladesh Sericulture Research and Training Institute (BSRTI), Baliapukur, Rajshahi	Textile and Jute	Cotton production and research

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Contents

Executive Summary

The Annual Report of this year presents the activities of Bangladesh Agricultural Research Council associated with governance, management and development of research programmes in the National Agricultural Research System. Highlights of the progress of the activities during 2012-2013 have been focused in this report.

Governing Body Meeting

The First Meeting of the Governing Body was held on 27 February 2013 in the BARC conference room. The meeting directed to explicitly describe the achievements attained by Sponsored Public Goods Research (SPGR) sub-projects so that it gives a clear idea about how the achievements are going to improve the agriculture and the farmers in the country. The meeting expressed satisfaction on the development of digital crop zoning and emphasized on updating it after every five years. The meeting also discussed the enhancement of honourarium of PhD scholars and other allowances for Governing Body, Executive Council, Board of Management of NARS institutes, and seminar/meeting etc.

Executive Council Meeting

The 2nd, 3rd, 4th, 5th, 6th and 7th meetings of Executive Council of BARC were held on 1st August, 7th October and 23rd December of 2012 and 27 February, 11 April and 6th June of 2013 respectively in the BARC conference room. The 2nd meeting discussed the equalization of grading system with the erstwhile class/division system of grading. The meeting formed a Committee to submit a report along with the recommendations. The 3rd meeting discussed the research proposals and budget of Bangladesh Sericultural Research and Training Institutes and Cotton Development Board for approval. It also discussed the matter relating to allowances of training, meeting, rapporteur and and expert reviewers of NARS institutes. The 4th meeting discussed the proposals and budget of research programmes of BARI and BINA, the *Guidelines of Allocation and Management of BARC Research Grants-2013*. The meeting also discussed allowances of training/seminar/workshop participants, guest speaker, farmers, course director and coordinator, session chair, rapporteur, key-note speakers, etc. The Executive Chairman, BARC mentioned the importance of Master Plan for determining future research plan and research priorities. The 6th meeting approved the research proposals and budget of BRRI and discussed the matter relating to enhancement of institutional capacity, operationalization of M&E Cell and MIS database. As per the decision of 2nd meeting, the 6th meeting presented the revised report on equalization of grade with previously class/division system. The 7th meeting discussed and approved the research proposals and budget of BJRI, BLRI, BFRI (Fisheries) and BFRI. The meeting also approved the appointment and promotion of BARC officers.

Project Implementation

The Asian Food and Agriculture Cooperation Initiative

The Asian Food and Agriculture Cooperation Initiative (AFACI) is an initiative of Rural Development of Administration (RDA), Republic of Korea is working with 10 Asian countries to stimulate the sustainable agricultural growth through the international R&D cooperation in agriculture and food sector. As Bangladesh is one of the members of AFACI, BARC initiated the following projects:

Development of Variety, Cropping System Research and Technology Transfer of Major Cereals for Sustainable Food Security in Bangladesh

BARC initiated the coordinated the project in June 2010 involving BARI, BRRI, DAE and BADC for implementing the project activities. The specific objectives was to develop and evaluate advanced materials for higher yield, tolerant to salinity, submergence, temperature for rice and wheat (where applicable) and to develop participatory research and technology transfer programme for sustainable crop

production and to update the knowledge and skills of agricultural professionals through training/visit/study tour/exchange programme.

Collection, characterization, conservation and utilization of Rice, Chili, and Minor Cereals in Bangladesh

This project was started under AFACI support in January 2012 and will be continued up to December 2014. Lack of proper strategies for national plant genetic resource conservation and adequate trained human resources are the major constraints in managing plant genetic resources in Bangladesh. Collection, characterization, conservation, utilization and regeneration of rice, chilli and some minor cereals are being conducting by this project in Bangladesh under the financial and technical assistance of AFACI. The specific objectives of this project are: 1) To secure the germplasm of rice, chilli and some minor cereals through exploration, collection and regeneration in Bangladesh; 2) To develop management system for PGR for easy access by the users; 3) To secure the sustainable use and conservation of safety back-up of genetic resources in Bangladesh. Bangladesh Agricultural Research Council (BARC), the apex body of the National Agricultural Research System (NARS) is coordinating the project. Two major National Agricultural Research Institutes viz., Bangladesh Agricultural Research Institute (BARI) and Bangladesh Rice Research Institute (BRRI) are working as implementing institutes.

Development of Locally Appropriate GAP Programs and Agricultural Produce Safety Information System of Selected Crops in Bangladesh

Under the technical assistance of AFACI, a 3-years project entitled as *Development of Locally Appropriate GAP Programs and Agricultural Produce Safety Information System of selected crops in Bangladesh* has been undertaken by BARC with the objectives to 1) introduce advanced GAP programmes for improving the safety of Tomato and Mango; 2) promote national GAP program at farm level and also enhance the national capacity on analytical technique to identify chemical and biological contaminants, and 3) establish the Asian agri-produce safety information network among AFACI member countries for exchanging current food safety issues and useful information such as national standards for primary production and border inspection criteria, pesticides use statistics, outbreak of food borne disease and so on.

Establishment of network and model manual on postharvest technology of horticultural crops in Asia

Under the technical assistance of AFACI, a three years project has been implementing by BARC with the objectives to: 1) build a cooperative system and to integrate practical knowledge targeted at postharvest quality maintenance and food safety of horticultural crops among participating Asian countries; 2) develop concrete actions aimed at resolving the existing problems of the postharvest industry with practical model manual on postharvest handling of Tomato, Cabbage and Mango and 3) enhance food safety and quality of Tomato, Cabbage and Mango by utilizing more efficient postharvest technologies and applicable advanced food safety policies.

SPGR Sub-projects on FSRD

The Sponsored Public Goods Research (SPGR) Coordinated Sub-project on *Farming Systems Research and Development for Farmers Livelihood Improvement* is coordinated by Crops Division, BARC and implemented by BARI, BRRI, BJRI, BSRI, BINA, BLRI, BFRI(Fish) and BFRI. The main objective of the project is to disseminate matured whole farming technologies developed by different NARS organizations to increase farm income and to improve the skills of the scientists/extension personnel involved in FSRD activities. The project commenced in February, 2012 with a holistic approach that includes the integration of different components of farming systems like crops, livestock, fisheries, agro-forestry and homestead agro-forestry. Different site

activities include: site characterization, development of sustainable cropping pattern(s), improvement of existing livestock production systems, improvement of fish production systems, development of homestead vegetables production and agro-forestry systems.

Research Management and Coordination

BARC has been providing research grants to various public organizations since 2004. BARC coordinated the research and technology transfer programmes of the NARS, and Agricultural universities through funding of the core research and human resource development. Further, the Planning and Evaluation division organized frequent review and desk/field monitoring, for its success. An amount of Tk. 140.00 lakhs was provided to the core research programmes.

Monitoring of Programmes/Activities

Nine teams were formed with the scientists of BARC for field monitoring of the research/technologies transfer programs carried out during the period of 2012-13. The teams were assigned to visit and monitor the BARC funded research/technologies transfer programmes implemented by different NARS and associate institutes. The following table presents the team composition, monitoring regions, organization visited:

National Agricultural Technology Project

The PIU-BARC in close collaboration with the agricultural Research Institutes (ARIs) and public universities is implementing Sponsor Good Public Research (SPGR) sub-projects and Enhancement of Research Institutional Efficiency (ERIE) activities to develop demand-driven technologies, promote sustainable intensification and diversification of agriculture including capacity building of the NARS institutes towards attaining the project objectives.

A concept paper on the project entitled *Adaptation to Climate Change and Rehabilitation of Livelihood in South West of Bangladesh (CLAP)* has been developed for funding from German Development Corporation (GIZ). The German Government has in principle accepted the project concept and the Technical Assistance Project Proposal (TPP) of the project.

Project Development/Project financing

During 2012-13, PIU offered 3 sub-projects totaling 108 in six spells. Considering the initial delay in start the duration of 29 sub-projects of the first stint and 58 in the second have been extended up to December 2013 by the Executive Council of BARC. Some new projects were under process of development. These are (i) Rejuvenation of degraded land, (ii) Enhancement of quality of jute fibre, (iii) Graphical user interface for open source biometric computing, (iv) Development of knowledge bank on fisheries, and (v) Development of knowledge bank on livestock.

Project Implementation

Out of 108, seven sub-projects have been completed as per thematic areas (16 sub-projects are within major crop sub sector, 15 soil and water management, 10 farming system research, 9 Livestock, 7 sub-projects each under the plant genetic resources, fishery and forestry; 6 sub-projects each under the un-favorable ecosystem and food safety, 5 sub-projects each goes to climate change issues and socio-economics, marketing, supply and value chain; and 3 sub-projects each under the farm machinery and productivity, post-harvest technology and ICT in agriculture). Activities and salient features of some of the implemented prospective SPGR sub-projects are briefly discussed below:

Research/Financial Management and Coordination

The PIU-BARC was actively involved in development, implementation, coordination, and monitoring, and reporting of the Sponsored Public Goods Research sub-projects during 2012-13. The key financial

management activities of PIU-BARC are maintenance of books and accounts, budgeting, banking operation, fund inflow. Total allocation during 2012-13 was 35.00 crore and expenditure was 31.75 crore, 90.70 % of the allocation.

Monitoring and Evaluation

Continuous desk monitoring of the SPGR sub-projects and ERIE activities has been done since inception to date. Several review meetings and discussion forums on SPGR were organized by the concerned technical divisions and the PIU-BARC. All required assistance by the PIU-BARC provided to the PCU appointed firm on concurrent monitoring and evaluation, and impact assessment (IA).

Fertilizer Technical Sub-Committee

Fertilizer Technical Sub-Committee was formed by the Ministry of Agriculture (MoA) in 1997 to help the National Fertilizer Standardization Committee. Member-Director (NRM), BARC works as the convener and Additional Director (Implementation), DAE as the Member Secretary of the committee. The committee comprises of 19 (nineteen) members with the CSO (Soils), BARC, CSOs of Soil Science Divisions of different NARS institutes, CSO, OFRD; representatives from different concerned organizations like Departments of Environment, Livestock, Fisheries, BSTI, SRDI, BADC, BCIC etc.

Two meetings of Fertilizer Technical Sub-committee were held with Member-Director (NRM) in the chair. A number of organic and chemical fertilizers and PGRs were evaluated in these meetings, among which twenty two (22) organic fertilizers were recommended for standardization to the National Fertilizer Standardization Committee headed by Secretary, Ministry of Agriculture.

ICT Activities

Computer and GIS unit of BARC is involved in overall ICT management of BARC in view of hardware, software, networking etc. and plays a vital role to establish ICT infrastructure and facilitate ICT and MIS related activities/services among NARS institutes. With the support of National Agricultural Technology Project (NATP), Computer and GIS unit already established a Data Center at BARC which connects 7 NARS institutes through Virtual Private Network (VPN). The development of MIS for NARS is in progress with NATP support. The MIS system once deployed will help identify skill gap, observe research trend in different sub-sector of agriculture, avoid wasteful duplication, apprehend investment trend and identify research capacity including physical facilities among many advantages.

Human Resources Development

During this period, training/workshop/higher study/study visit programmes have been arranged where scientists/officers from the NARS institutes/Ministry of Agriculture participated in the NATP/Revenue funded programs at home and abroad. It may be mentioned that 1523 scientists/officers attended the revenue funded training/ workshop/higher study programs while the remaining 3183 scientists/officers participated in the NATP funded training/workshop/higher study/study visit programs at home and abroad. Besides, foreign training/seminar/workshop/ meeting in different countries of the globe have been arranged.

In-country PhD

One of the major tasks of Manpower of Training Unit of BARC is to offer higher studies for NARS scientists in various disciplines of agriculture and beyond. During 2008-2009, 18 in-country PhD have been offered to the scientists of NARS under revenue budget. Almost all the PhD fellows joined their respective institutes upon completion their PhD program for the period of 2009-2012. Meanwhile, fresh applications have been sought from the NARS institutes for the revenue funded in-country PhD Program for the period of 2013-2016.

There was a provision of five slots for in-country PhD under CSISA-BARC Scholarship Program. Three officers- one from BARC and two from BARI are pursuing PhD and remaining two- one from BFRI (fisheries) and other from BINA are under admission process.

In-country PhD (PIU-BARC): NATP Phase-I

During the reporting period 60 PhD scholars are pursuing their courses and research work in different public universities within the country. The PhD scholarships were nominated from among the NARS institutes as BARI-25, BRRI-10, BJRI-7, BSRI-5, BINA-3, SRDI-4, BFRI (fish)-4, BTRI-1 and MoA-1. It may be mentioned here that all of PhD scholars have already completed their courses and most of them completed their field research. In addition, under SPGR sub-projects nineteen scholars are pursuing their PhD degree in different universities in Bangladesh.

Foreign PhD (PIU-BARC): NATP Phase-I

Under the PIU-BARC: NATP Phase-1, 30 slots were earmarked for foreign PhD programs for the scientists of National Agricultural Research System (NARS) and all the selected PhD scholars have taken admission in the universities of different countries like Malaysia, Thailand, China, Philippines, India and Sri Lanka. Some of the scholars have completed their PhD and the remaining will complete their PhD program by 2014.

Foundation Training

The 23rd Foundation Training Course of the National Agricultural Research System (NARS) scientists was arranged at Bangladesh Academy for the Rural Development (BARD) in Comilla. The course duration was four months from January 23, 2013 to May 23, 2013 in which 40 officers took part. The program was conducted by BARD Comilla and sponsored by Bangladesh Agricultural Research Council. The newly recruited Scientific Officers from different NARS institutes were the participants in this course. The program was financed by PIU-BARC:NATP Phase I.

Administrative and Financial Management

A 14-day Training Program on Administrative and Financial Management was organized at Bangladesh Academy for Rural Development, Kotbari, Comilla with 40 PSOs and CSOs from different NARS institutes. The objective of the training program was to provide these senior level scientists/researchers with the modern concepts of administrative and financial management system.

I. HIGHLIGHTS OF RESEARCH AND DEVELOPMENT

CROPS

Project Implementation

The Asian Food and Agriculture Cooperation Initiative

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A. Bangladesh Rice Research Institute

Plant Breeding, Rice Farming and Applied Research Division of BRRI are implementing the research and development activities of the project. The achievement so far as follows:

- ***Confirmation of crosses for submergence tolerance, Sub1 gene for T. Aman***: Ten crosses were confirmed among twelve crosses. F2 seeds from 6 crosses and BC1F1 seeds from 4 crosses were produced. The seeds were properly collected and preserved for future use.
- ***Screening of germplasm for submergence tolerance in T. Aman:*** Among the 100 germplasm, 11 genotypes were found non-elongating type (survivability score 5) which could be considered for further investigation. Participatory variety selection (PVS)- mother trial in T. Aman: In PVS BRRIdhan52 got the highest vote.
- ***Participatory variety selection (PVS) - baby trial in T. Aman:*** The yield of Chiherang-Sub1 (ranging from 2.5-3.5 t/ha) was higher than IR64-Sub1 (ranging from 2.2-3.0 t/ha).
- ***Advanced yield trial (AYT) for deepwater rice:*** The genotype BR224-2B-2-5 (2.8 t/h) and BR5915-B-7 (2.6 t/ha) was selected for RYT.
- ***Development of breeding population through hybridization of Boro rice***: Thirteen crosses were made for Boro season. In these crosses gene (s) for salinity tolerance was transferred to popular varieties from local rice varieties of coastal areas using Pokkali and Nonabokra derived sources.
- ***Confirmation of crosses for salinity tolerance of Boro rice***: Four crosses were confirmed by careful observation of plant characters with comparison of respective parents. After confirmation, F2 seeds were collected and preserved.
- ***Growing of F2 population of Boro rice***: One hundred twenty eight desirable progenies were selected from nine F2 populations and preserved to grow in next season.
- ***Selection of progenies from segregating population for salinity tolerance***: Twenty nine progenies were selected from three F3 populations for Boro from the pedigree nursery. It is important to note that the selected materials were derived from the crosses between salt tolerant varieties and elite lines and thus expected to be salt tolerant and adapted to the saline prone coastal environment.
- ***Participatory variety selection of Boro rice***: Based on the farmers' choice, BR7084-310-AC3-7 (PVS-10) and BR7084-310-AC3-1 (PVS-7) were selected as the best materials by the farmers. BR7786-AC1B-2-1-3-3-3 (PVS-4) and BRRIdhan28 (PVS-11) were selected as the worst materials by the farmers. Screening of rice germplasm against salinity tolerance at seedling stage of Boro rice: Among 81 genotypes, only 14 genotypes showed visual score 3 to 5 that is tolerant to moderately tolerant. However, other genotypes showed visual score 7 to 9 that was susceptible to highly susceptible.
- ***Improvement of existing Boro-Fallow-Fallow cropping pattern through introduction of DWR after Boro***: An additional yield of about 2 t/ha could be achieved if farmers manage to established DWR after Boro. BY establishing DWR early and top dressing two times urea, DWR cultivation was possible.

- ***Improvement of existing B. Aman/T. Aman-Boro cropping pattern by B. Aman/T. Aman-Mustard-Boro (double transplanting):*** An additional crop of about 0.9 t/ha of mustard could be obtained if mustard is introduced into the cropping pattern in between Aman and Boro. Mustard variety should be short duration. Double transplanting (DT) of Boro facilitated to introduce mustard in T. Aman/B. Aman – Boro system. DT also increased Boro yield slightly.
- ***Rice production by using USG applicator in T. Aman, 2012***: Majority farmers were interested to grow BRRIdhan49 for better yield, fine grain and medium growth duration and high market price. Farmers are interested to use USG applicator.
- ***Farmers' training***: Four farmer's trainings were conducted at Satkhira. 120 farmers and 20 SAAOs were trained.

B. Bangladesh Agricultural Research Institute

Plant Breeding Unit of Wheat Research Centre (WRC), Gazipur of BARI with the support of OFRD is implementing the research and development activities of the project. The achievement so far as follows:

- ***Development of high yielding heat and saline tolerant wheat variety (Hybridization):*** Forty single crosses (25 for heat tolerance and 15 for salinity tolerance) were made involving high yielding heat and salinity parents which will be confirmed next year by regular programme.
- ***Confirmation of crosses:*** Twenty-nine F1 hybrids derived from the crosses made during 2011-12 were grown with the corresponding female parent to confirm the crosses. Twenty-five crosses were confirmed.
- ***Selection in F2 generation***: Thirty-three F2 families were grown from where 23 families were selected on the basis of good agronomy, disease resistance, earliness, good grain quality. Single spikes of the selected plants from selected families were harvested and bulk to grow as F3 next year.
- ***Screening of wheat genotypes against terminal heat stress:*** Fifty advance lines of wheat were grown at Gazipur under two growing environments: (a) Irrigated timely sown and (b) irrigated late sown (ILS) with transparent polythene cover grain at filling stage. Among those 10 entries viz. 1, 3, 13, 19, 21, 26, 33, 36, 37 and 42 were selected for further evaluation.
- ***Screening of wheat genotypes against salinity and laboratory and field conditions:*** Twelve advance wheat lines were tested against at $5dSm^{-1}$ and $10dSm^{-1}$ salinity under controlled condition of which genotypes BAW 1135, BAW 1142, BAW 1143, BAW 1147 and BAW 1157 were found tolerant to salinity of $10dSm^{-1}$. Under field condition 16 genotypes were tested in saline soil of southern Bangladesh at Patuakhali, Noakhali and Shatkhira. Out of 16 genotypes, seven genotypes viz. BAW 1142, BAW 1147, BAW 1154, BAW 1135, BAW 1157, BAW 1159 and BAW 1161 were selected as moderately tolerant to salinity. These lines will be further evaluated next year.
- ***Improvement of existing Wheat-Jute-T. Aman cropping pattern by introducing suitable varieties:*** New high yielding wheat varieties BARI Gom 25 and BARI Gom 26 were introduced in the existing Wheat-Jute-T. Aman cropping pattern in Faridpur district replacing old wheat variety Shatabdi. Short duration Mung bean variety BARI Mung 6 and rice variety BRRIdhan39 were also introduced in this system. Total productivity of the system has been improved. The average yield of 6 farmers in a cropping pattern basis were 3.58 -2.82-2.75 t/ha from wheat- jute-T.aman, respectively.
- ***Participatory up-scaling of new wheat varieties in farmers' field:*** The wheat varieties Prodip, BARI Gom 25, BARI Gom 26 and were demonstrated in the farmers' field at Barisal, Faridpur and Rajbari where varieties viz., Prodip and BARI Gom 26 yielded 4.09 and 3.32 t/ha, respectively. Power tiller operated seeder was used in most of the sites for seeding. The yield was higher at Faridpur site (BARI Gom 25-4.09 t/ha, BARI Gom 26- 4.21 t/ha and BARI Gom 27- 3.40 t/ha). At Rajbari, BARI Gom 26 and BARI Gom 27 yielded 3.60 and 3.50 t/ha, respectively. All the farmers kept seed for next year's use and exchange with the neighbouring farmers.
- ***Up-scaling of Power Tiller Operated bed planter and strip tillage in the farmers':***Both the planters were introduced in 2 villages of Rajshahi each 0.60 ha. Two high yielding varieties were sown with these seeders. Under bed planting system, BARI Gom 25 and BARI Gom 26 yielded 4.37 and 4.35 t/ha, respectively. While, under strip tillage BARI Gom 25 and BARI Gom 26 yielded 4.21 and 4.19 t/ha, respectively.
- ***Training on wheat cultivation and preservation:*** A total of 149 farmers, 31 field level officers and 21 senior officers were given training on wheat cultivation and seed preservation in six batches. Moreover, 2 field

days were organized at Noakhali and Rajshahi where 154 farmers attended.

C. Department of Agricultural Extension

- ***Demonstration of wheat variety (Prodip, BARIGom-25 and BARIGom-26):*** The crop was sown from 20 November to First December, 2012. Total area was 3.5 hectare. The crop was harvested 9-28 March, 2013. On an average grain yield was 2.89- 3.10 t/ha at Fakirhat and 2.75-3.10 t/ha at Mollarhat. The farmers are very much encouraged to see the performance of newly developed wheat variety in this area. More area was covered this year than last year (2011-12).
- **Block demonstration with saline tolerant rice varieties (BRRIdhan47, and Bina dhan 8):** Two saline varieties (BRRIdhan47, BRRIdhan55 and Binadhan 8) were transplanted at Fakirhat and Mollarhat in December, 2012 and harvested with good yield of around 6.5-7.0 ton/ha. The farmers of the area were very much encouraged to see the performance of this varieties and kept seeds for next year.

D. Bangladesh Agricultural Development Corporation: Four metric ton of rice variety BRRIdhan-29 (Boro TLS Seed) was produced at BADC Farm, Modhupur. Two metric ton of wheat variety BARIGom-26 (Foundation Seed) was produced at Bhanga, Faridpur by contract farmers of BADC. One eighty contract farmers were provided training on seed production technology and post harvest technology of rice and wheat.

E. Bangladesh Agricultural Research Council

- Arranged 6 programme planning & coordination meetings.
- Arranged three review workshop, 2011, 2012 and 2013.
- Performed field monitoring/visit of Korean delegates 2 times.
- Performed field monitoring 4 times.
- Attended Principal Investigator meeting on June 2011 in Korea.
- Arranged training of 2 scientists of BARI & BRRI to Korea 2011.
- Arranged 2-day training programme at BARC, 2011 and 2013.
- Published booklet on rice and wheat cultivation under unfavourable ecosystem.
- Published progress report (2010-12) and final report of 2010-2013 to AFACI.
- Prepared training manual on rice and wheat cultivation in unfavourable ecosystem in 2011 and 2013.

Collection, characterization, conservation and utilization of Rice, Chili, and Minor Cereals in Bangladesh

This project was started under AFACI support in January 2012 and will be continued up to December 2014. Lack of proper strategies for national plant genetic resource conservation and adequate trained human resources are the major constraints in managing plant genetic resources in Bangladesh. Collection, characterization, conservation, utilization and regeneration of rice, chilli and some minor cereals are being conducting by this project in Bangladesh under the financial and technical assistance of AFACI. The specific objectives of this project are: 1) To secure the germplasm of rice, chilli and some minor cereals through exploration, collection and regeneration in Bangladesh; 2) To develop management system for PGR for easy access by the users; 3) To secure the sustainable use and conservation of safety back-up of genetic resources in Bangladesh. Bangladesh Agricultural Research Council (BARC), the apex body of the National Agricultural Research System (NARS) is coordinating the project. Two major National Agricultural Research Institutes viz., Bangladesh Agricultural Research Institute (BARI) and Bangladesh Rice Research Institute (BRRI) are working as implementing institutes.

Several teams of Plant Genetic Resources Centre (PGRC), BARI visited the northern, southern and hill districts (south eastern) and have collected 122 chilli and 6 minor cereals germplasm. A total of 10 districts have been covered so far. Progress regarding collection of germplasm is given below.

A. Chilli germplasm collected from different districts

Collection team	Collection Code	Location	Date of collection	Crop	No. collected
Dr. M. Al-Amin, CSO, Dr. M. Sultan Alam, PSO, Iftekhar Ahmed, SO and Md Rezwan Molla, SO, PGRC, BARI, Gazipur.	ASIR	Bogra	17 June '12	Chili	4
				Foxtail millet	2

Rais Uddin Chowdhury and Dr. M. A. Malek.	RM	Joypurhat	20 July'12	Chilli	9
Md. Rezwan Molla, SO and Iftekhar Ahmed, SO	RI	Khagrachari	15-18 Oct '12	Chilli	39
				Foxtail millet	1
Md. Rais Uddin Chowdhuri, PSO and Dr. Md. Tariqul Islam, PSO, Plant Genetic Resources Centre, BARI, Gazipur	RT	Jamalpur	15-20 Oct '12	Chilli	25
Dr. Md. Amjad Hossain, CSO, PGRC, Dr. Md. Abdul Malek, PSO, PGRC, and Dr. Mian Sayeed Hassan, PSO, BARC	AMS	Patuakhali,Barguna, Barisal, Jhalokathi, and Faridpur	17-20 Oct '12	Chilli	45
				Foxtail millet	1
Dr. Md. Amjad Hossain, CSO, PGRC, Dr. Md. Sultan Alam, PSO, PGRC, Iftekhar Ahmed, SO, PGRC and Md. Rezwan Molla, SO, BARI	ASIR	Thakurgaon	31 Jan '13	Buckwheat	1
				Foxtail millet	1
Dr. Md. Amjad Hossain, CSO, PGRC, BARI	AH	Gazipur	11-21 Oct '12	Chilli	7
Dr. Md. Amjad Hossain, CSO, Dr. Md. Sultan Alam, PSO, Iftekhar Ahmed, SO & Md. Rezwan Molla, SO, PGRC, BARI	ASIR	Kishoreganj	17 Mar '13	Chilli	1

Total germplasm collected so far: Chilli: 129, Foxtail millet: 5, Barley: 1, Buckwheat: 1

Characterization and Regeneration of Germplasm

a. **Morphological characterization and evaluation of chilli:** Seeds of 116 newly collected germplasm have been sown in seed bed on 04 December 2012 and transplanting has been done on 31 January 2013 at PGRC, BARI, Gazipur. Some plants are in flowering stage while most of the plants are in vegetative stage. Data recording on seedling and morphological characterization is going on.

b. **Morphological characterization of prosomillet:** Seeds of 50 base collections have been sown on 05 December 2012 at PGRC, BARI, Gazipur. The plants are in grain filling stage now. Data recording on seedling and morphological characterization is going on

c. **Morphological Characterization of Barley:** Seeds of 54 (53 base collection and 1 new collection) have been sown on 03 December 2012 at PGRC, BARI, Gazipur. The plants are in maturity stage now. Growth condition of all the accessions is quite satisfactory. Some of the accessions will be ready for harvesting within one week. Data recording on seedling and morphological characterization is going on

d. **Morphological Characterization of Foxtail millet:** Seeds of 35 (30 base collection and 5 new collections) have been sown on 18 December 2012 at PGRC, BARI, Gazipur. The plants are in vegetative stage now. Growth condition of all the accessions is quite satisfactory. Data recording on seedling and morphological characterization is going on.

e. **Regeneration of minor cereals (barley and foxtail millet) germplasm:** Seeds of 5 foxtail millet, 1 barley and 1 buckwheat lines have been sown on 05 December 2012 at PGRC, BARI, Gazipur. The plants are in vegetative, flowering, grain filling, and maturity stage now. Growth condition of all the accessions is quite satisfactory. Data recording on seedling and morphological characterization is going on.

Development of Locally Appropriate GAP Programs and Agricultural Produce Safety Information System of Selected Crops in Bangladesh

Demand of safe and high quality food produced under Good Agricultural Practices (GAP) have been increasing in recent years. Many developing countries including Bangladesh are facing challenges in national and international trading under WTO free trade agreements, multiplicity of governmental GAP standards and private sector requirements. To improve the situation, under the technical assistance of AFACI, a 3-years project entitled as *Development of Locally Appropriate GAP Programs and Agricultural Produce Safety Information System of selected crops in Bangladesh* has been undertaken by BARC with the objectives to 1) introduce advanced GAP programmes for improving the safety of Tomato and Mango; 2) promote national GAP program at farm level and also enhance the national capacity on analytical technique to identify chemical and biological contaminants, and 3) establish the Asian agri-produce safety information network among AFACI member countries for exchanging current food safety issues and useful information such as national standards for primary production and border inspection criteria, pesticides use statistics, outbreak of food borne disease and so on.

Two major crops tomato and mango have been selected to improve the quality and safety in Bangladesh through establishment of GAP systems and agri-produce safety information network among AFACI member countries. Two sites for Tomato i.e., Jamalpur, Comilla (Chandina) and two sites for Mango (Chapai Nowabgonj & Rajshahi) have been selected for project activities. Relevant literatures on

food safety and quality issues were collected for reviewing the national Policies, Acts, Plans of Action and strategy documents which impact on food safety and quality in Bangladesh.

A day-long training on "Good Agricultural Practice (GAP) in Fruits and Vegetables Production" was conducted April, 2013 to sensitize the stakeholders on GAP principles and codes. Forty senior level scientists of National Agricultural Research System, extension provider from DAE and production specialist from BADC were participated in the training programme. A preliminary list of scientists and others personnel working with GAP have been selected to prepare the GAP Net work in Bangladesh.

To ascertain the status of GAP implementation, food safety issues and hygienic practices at the production level of both the target crops (Tomato and Mango) a survey has just started. Questionnaires have developed for conducting survey from selected sites for Tomato and Mango. Survey on tomato from Chandina Upazila of Comilla and mango frm Rajshahi were conducted which highlights the following findings:

- GAP is not currently adopted in tomato, even any crop in Bangladesh.
- Risk of contamination of fruits and vegetables is high at all stages in the supply chain with possible sources being soil, faeces, water and handling of the produces harvesting and processing equipment and transport of fruits and vegetables.
- Soil and water use for irrigation are not tested which may pollute the produce.
- Use of untreated manure can spread pathogens while imbalanced use of chemical fertilizers can degrade the soil and pollute the water.
- Produces are being harvested immature, too soon after pesticide application, or at the wrong time of the day.
- There are some evidences of indiscriminate and over uses of pesticides that may create threat for their residual effects on human health, ecology and environment.
- Knowledge of IPM is not widespread and pesticides tend to be applied following a calendar-based rather than a needs-based approach.
- Risk-averse farmers frequently believe that reducing use of pesticides would significantly reduce their yield.
- Concern to maximize income often leads farmers to sell produce that has only recently been sprayed; ignoring recommended pre-harvest intervals (PHI).
- Most of the farmers often do not know when to apply pesticide and are unaware of the correct product or dose.
- Knowledge at farm level of factors contributing to microbial contamination and food adulteration is reportedly negligible.

Establishment of network and model manual on postharvest technology of horticultural crops in Asia

Bangladesh produces a diversity of fruits and vegetables on a seasonal basis. Postharvest management in Bangladesh, is far from satisfactory as in most developing countries of the region. Inadequate handling, poor-storage and improper distribution resulted huge losses in diminished returns to producers. Traditional techniques are generally practiced by growers, traders and processors which result in considerable deterioration of physical and nutritional quality. Simultaneous harvesting often leads to a glut situation in the market and to reduced prices to farmers. Market opportunities are exists for processed foods of fruits and vegetables both in domestic and export markets. Postharvest losses in food grains in Bangladesh are reported at an estimated 15%, while in fruits and vegetables they are estimated at 20–25%, these losses may go as high as 40%. Postharvest losses vary greatly across commodity types, with the location of production and season. Improvement of new technologies on postharvest through organized research and development to reduce the losses fruits and vegetables thereby strengthen the economy of the country.

Accordingly, under the technical assistance of AFACI, a three years project entitled as *Establishment of network and model manual on postharvest technology of horticultural crops in Asia* has been implementing by BARC with the objectives to: 1) build a cooperative system and to integrate practical knowledge targeted at postharvest quality maintenance and food safety of horticultural crops among participating Asian countries; 2) develop concrete actions aimed at resolving the existing problems of the postharvest industry with practical model manual on postharvest handling of Tomato, Cabbage and Mango and 3) enhance food safety and quality of Tomato, Cabbage and Mango by utilizing more efficient postharvest technologies and applicable advanced food safety policies.

Two sites for tomato i.e., Jamalpur, Comilla (Chandina), one site for cabbage (Jessore) and two sites for mango (Chapai Nawabgonj & Rajshahi) have been selected for project activities. To ascertain the status of postharvest status of the target crops (tomato, cabbage and mango) a survey has just started. Questionnaires have developed for conducting survey. Survey on tomato from Chandina Upazila of Comilla and mango from Rajshahi were conducted. Draft manual on tomato was completed. A preliminary list of scientists and others personnel working with postharvest activities of fruits and vegetable has been selected to prepare the postharvest Network in Bangladesh.

Comments/segmentation made on reports/ documents (2012-13)

ক্র:নং	বিষয়	তারিখ
1.	পাট আইন ২০১৩ এর খসড়ার উপর বাংলাদেশ কৃষি গবেষণা কাউন্সিল এর মতামত	২৪ জুন ২০১৩
2.	পাম ও আগরকে কৃষিপণ্য হিসেবে গণ্য করার ক্ষেত্রে সরকারি নীতিমালা বিষয়ে বাংলাদেশ কৃষি গবেষণা কাউন্সিল এর মতামত	২২ এপ্রিল ২০১৩
3.	Aid Memoire of the Inception Mission (20-24 January 2013) on TA: 7848-BAN: Climate Change Capacity Building and Knowledge Management	৬ মার্চ ২০১৩
4.	National Drought Policy (HMNDP) এর ওপর বিএআরসি'র মতামত প্রদান	৬ মার্চ ২০১৩
5.	Scope of Nanotechnology in Agriculture of Bangladesh প্রসঙ্গে বিএআরসি'র মতামত	১১ নভেম্বর ২০১২
6.	২২-২৩ ডিসেম্বর ২০১২ তারিখে থাইল্যান্ডের মাননীয় প্রধানমন্ত্রীর বাংলাদেশ সরকারি সফর উপলক্ষ্যে ইনপুট প্রেরণ	২০ নভেম্বর ২০১২
7.	(*Jatropha curcas*) বীজ আমদানি প্রসঙ্গে বিএআরসি'র মতামত।	০৩ অক্টোবর ২০১২
8.	বীরগঞ্জে আলু সংরক্ষণে বিদ্যুৎ বিহীন হিমাগার বিষয়ে বিএআরসি'র মতামত	৩ সেপ্টম্বের ২০১২
9.	জাতীয় অর্গানিক নীতিমালা প্রণয়নের প্রয়োজনীয়তার উপর মতামত প্রেরণ	৩ সেপ্টম্বের ২০১২
10.	Cooperation with FAO for Sustainable Agriculture Development in Bangladesh	

SPGR Sub-projects on FSRD

The Sponsored Public Goods Research (SPGR) Coordinated Sub-project on *Farming Systems Research and Development for Farmers Livelihood Improvement* is coordinated by Crops Division, BARC and implemented by BARI, BRRI, BJRI, BSRI, BINA, BLRI, BFRI(Fish) and BFRI. The main objective of the project is to disseminate matured whole farming technologies developed by different NARS organizations to increase farm income and to improve the skills of the scientists/extension personnel involved in FSRD activities. The project commenced in February, 2012 with a holistic approach that includes the integration of different components of farming systems like crops, livestock, fisheries, agro-forestry and homestead agro-forestry. Different site activities include: site characterization, development of sustainable cropping pattern(s), improvement of existing livestock production systems, improvement of fish production systems, development of homestead vegetables production and agro-forestry systems.

Inception workshop, program planning workshop, coordination meeting and progress review workshop were organized and the proceedings of each workshop were distributed among the participants for necessary action. A baseline survey had been completed in collaboration with the Principal Investigators of participating institutions.

Two orientation trainings, one for 19 newly recruited Field Assistants (FAs) and the other for 30 newly recruited Scientific Officers (SOs) were organized on 23-24 September 2012 and 27-28 November 2012, respectively to acquaint them with Farming Systems Research and Development (FSRD) activities. Besides, training on FSRD technologies was also organized in two batches on 07-09 March 2013 and 18-21 March 2013, respectively to improve the skills of both project and core scientists.

A training manual consists of 24 lecture notes related to FSRD methodology and technologies was compiled after necessary corrections and distributed among the trainees.

Several field visits were arranged through FSRD project in different FSRD sites of NARS institutes for monitoring and evaluation of the individual components of the sub-projects. Field trip reports were distributed among the respective concerned persons for smoothly implementation of the sub-project activities.

Farming System Research Project Field Monitoring at Sylhet

Budgetary Information: Total Approved Budget Tk. 48,19,300.00; Fund released (to date) Tk. 38,81,725.00; Fund spent (to date) Tk. 33,21,787.00

A Review Workshop on Crop Protection was held on 29-30 August 2012. Crop protection is divided into two parts, entomology and plant pathology. In first day 55 entomologists and in 2nd day 55 plant pathologists from five NARS institutes viz. BARI, BRRI, BJRI, BINA and BSRI took part in the two days workshop. The Research progress for 2011-12 and Research programs for 2012-13 were thoroughly discussed in the workshop. A training on Phytosanitary Measures and Food Safety Issues in Bangladesh was organized during 13-14 February 2014 through revenue funding of BARC.

PLANNING AND EVALUATION

A. Project Implementation/Project Financing

The Project Implementation Unit (PIU) of BARC is implementing the research component of National Agricultural Technology Project (NATP). This component is coordinated by Planning & Evaluation Division. A total of 108 Sponsored Public Goods Research (SPGR) sub-projects in selected identified thematic areas are being implemented at different NARS institutes and public universities of the country. Planning Evaluation Division with the assistance of the other divisions also monitoring the SPGR sub-project.

Developed a concept paper on the project entitled *Adaptation to Climate Change and Rehabilitation of Livelihood in South West of Bangladesh (CLAP)* for funding from German Development Corporation (GIZ). The German Government has morally accepted the project concept and the Technical Assistance Project Proposal (TPP) of the project.

Being the member of seven member Proposal Evaluation Committee (PEC), Member-Director (Planning & Evaluation) made major contribution in recruiting the National Core and Short-term Consultants for the National Agricultural Technology Project (NATP)-Phase-I.

B. Research Management and Coordination

To facilitate research and technology transfer, BARC is providing research grants to various public organizations since 2004. During the period, this division coordinated the research and technology transfer programmes of the NARS, and Agricultural universities through funding of the core research and human resource development. Further, the Planning and Evaluation division organized frequent review and desk/field monitoring, for its success. An amount of Tk. 140.00 lakhs was provided to the core research programmes. Findings of the completed projects implemented through different organizations are briefly described below:

Bangladesh Agricultural Research Institute

Improvement of gladiolus quality and its adaptation: Different concentrations of GA_3 showed significant effect on the days to 50% spike initiation, spike length, rachis length, number of florets per spike, flower yield and vase life. All concentrations of GA_3 significantly improved the characteristics of gladiolus over control, while the most effective concentration was 200 ppm GA_3. Large size corms were found to show better performance than small size corm in respect of all parameters. However, the treatment combination of GA_3 at 200 ppm and large size corm showed best performance in respect of flower production of gladiolus. B and Zn both either in single or in combination exerted tremendous effect on the yield and quality of gladiolus. However, with subsequent addition of higher rates of B and Zn progressively increased the selective growth and flower characters to some extent and be the further increment of the dosage declined the results noticeably. Floral characters like floret number, vase life and flowers yield also significantly influenced by treatment $B_{2.0}$ $Zn_{3.0}$ kg ha^{-1}. Similar trend was noticed as well in single application of B and Zn with increased rates. BARI Gladiolus-1 and BARI Gladiolus-3 showed better performance and produced higher yield at all locations.

Development of technology for production of seedless fruits of guava and lemon (Mini Elachi Lebu) in off-season: Results revealed that no seedless fruit was obtained except GA_3 applied at the rate of 300 ppm at one week after flowering. Simultaneously the flower bud which initiated within

fourteen days after GA_3 (200 and 300 ppm) induced seedless fruit. Accordingly GA_3 was applied at the rate of 0, 200, 300 and 400 ppm 1 and 2 weeks before flower bud initiation and one week after flower bud initiation on January 2014 for more confirmation. In case of Kazi peyara, higher concentration of GA_3 (300, 400, 500, 750 ppm) were applied on October 2013. Fruits are in developing stage.

Evaluation of Short Duration High Yielding Rapeseed-Mustard Varieties/Lines for Cultivation Between T.Aman and Boro Rice: The experiment has been initiated to enhance local production of *Brassica* edible oil. T. Aman-Mustard-Boro cropping pattern has been conducted at 10 farmers' field in Jamalpur and Sherpur districts. BINAdhan 7 was transplanted at the ten selected farmers' field in Aman season. It was observed that the yield of this short duration rice variety varied from 2668-3557 kg mon/ha and average yield was 2964 kg/ ha. As it is an early variety, farmers could easily cultivate rapeseed mustard after harvest of T. aman. In Rabi season, two sets of experiments were initiated at the same area in the ten farmers' fields just after harvest of BINA dhan 7. Set-1 was comprised of 8 promising lines of *Brassica campestris* including BARI Sharisa 14 and Tori-7 as checks. Similarly, set-2 was comprised of 8 promising lines of *Brassica napus* including BARISharisa 8 as check variety. All these lines of rapeseed were selected on the basis of their previous evaluation at RARS, Jamalpur in last year. The seedling of boro rice is ready now for transplantation and it will be done after harvest of rapeseed mustard.

Integrated Management of Banana Diseases Incited by Fungi and Nematode: Three popular banana growing areas such as Mithapukur, Rangpur; Sibganj, Bogra and Pirojpur sadar were surveyed for panama in December-January period where the disease incidence was found 7.2, 6.3 and 13.0% respectively. The infestation of other diseases like sigatoka, bunchy top and mosaic was also found low during the survey. The collected pathogen of panama was purified and stored for future use. Panama disease incidence of banana cultivars in Bangladesh varied widely location-wise and the cultivated cultivars like sabri, champa and cooking banana seemed to be more susceptible to panama disease compared to Amritasagar or Mehersagar. The incidence of nematode was found as negligible in the survey areas.

Up-scaling of Summer Onion Bulb and Seed Production Technology at Farm Level: Yield of summer onion bulb in *kharif* II showed higher than that of *kharif* I season irrespective of varieties. Again, yield showed higher in Faridpur than that of Rajbari. Three varieties (BARI Piaz 2, BARI Piaz 3 and BARI Piaz 5) showed reasonable yield. In *kharif* I season at Faridpur, mean yield of two years (2011-2012 and 2012-13) of BARI Piaz 2, BARI Piaz 3 and BARI Piaz 5 was 12.27 t ha^{-1}, 13.60 t ha^{-1} and 14.18 t ha^{-1}, respectively and at Rajbari, it was 11.60 t ha^{-1}, 10.27 t ha^{-1} and 11.04 t ha^{-1}, respectively. In *kharif* II season of two year average at Rajbari, mean yield of BARI Piaz 3 and BARI Piaz 5 was 13.75 t ha^{-1} and 15.98t ha^{-1}, respectively. Yield showed higher in *kharif* II than *kharif* I due to higher life duration in Kharif II than Kharif I. Seed production was not satisfactory and that might be due to the lack of pollination, natural hazard etc. Average seed yield of two years of BARI Piaz 5 was 91 $kgha^{-1}$ whereas BARI Piaz 3 gave 75 kg ha^{-1}. Arranged 5 fielddays where 500 farmers of different categories participated. However, in season of Kharif II, 2013 bulb production of BARI Piaz 3 and 5 were transplanted in 5 sites of Faridpur and Rajbari. Almost of all sites were harvested and average yield was 30-36 t ha^{-1}. For seed production in *rabi* 2013-14 and *kharif* I 2014 for bulb production, yield report of bulb and seed production will be done after June 2014.

Export and Import Parity Analysis of Selected Vegetables and Spices in Bangladesh: Higher value addition was estimated for bitter gourd producers (Tk 152,145/ha) followed by pointed gourd producers (Tk 133,396/ha). Comparatively lower value addition was calculated for garlic producers (Tk 99,352/ha). On the other hand, higher value addition was calculated for vegetable exporters of Tk 57173/t at UK and Tk 45798/t at Middle East followed by vegetable suppliers (Tk 3270/t). Highest Benefit Cost ratio was calculated for garlic (1.8) compared to pointed gourd (1.7), bitter gourd (1.6) and onion (1.6). The estimates of DRC showed that Bangladesh had comparative advantage in bitter gourd and pointed gourd production as the estimates of DRC and onion and garlic were also less than unity meaning that the production of onion and garlic would be highly efficient for import substitution.

Development and dissemination of a low cost power tiller operated potato planter: The improved potato planter was demonstrated and trials were set up on station of Regional Wheat Research centre, Shyampur, Rajshahi and in the farmers field of Sibpur, Puthia Baripara, and Pakuria, Pabna of Rajshahi district during 22-29 Novamber 2013. There are 9 farmers field where potato planter was demonstrated and trials were set up demonstration. Both whole tuber potato seed and cut piece potato seeds were used. The potato planter acts as furrow

making, placing whole tuber seeds in pre-determined distance (20 cm) with regular interval and earthing up simultaneously. For cut piece seeds, the distance was 15-17 cm. It creates a trapezoidal bed shape, bottom width 55 cm and top 40 cm. Uniformity of seed spacing was 95-97% and missing seed for whole tuber seed 2-3% and for cut piece seeds 5-6%, respectively. Potato planter saved labour cost by 75% compared to conventional manual planting method. Two manufacturers start fabrication of potato planter.

Development of packages for fruits (mango, banana) and vegetables (yardlong bean, pointed gourd, okra): The experiment was conducted to evaluate the effect of plastic/wooden crates and packaging materials on the quality and shelf life of pointed gourd during transportation and storage using passive modification of modified atmosphere packaging system. The modified atmosphere was created by making perforation in the polypropylene packets. Pointed gourd pre-treated with chlorine water (200ppm chlorox/halotab, 2 tablets per 1.5 litre water) and then transportation in wooden or plastic crates and packaging and storing in 1.2% perforated polypropylene packets resulted substantial reduction in losses due to physiological weight loss and rotting/shriveling and retained considerable marketable quality. The treatment combinations also considerably retained vitamin C and A (β-carotene).

Study on Rural Households' Food Security in Coastal Region of Bangladesh: The study was conducted in six coastal districts namely Khulna, Bagherhat, Satkhira, Patuakhali, Bhola and Barguna of Bangladesh during the period of 2011-12 to 2012-13. The study based on a sample of 900 coastal households revealed that most households (53%) were food secured whose calorie intake (2795kcal/capita/day) was much higher than the national average (2318 kcal/capita/day). Logit model revealed that farm land size, farm income, off-farm income, and household crop production had positive and significant impact in attaining food security of the coastal households. Besides, small households and the households with more earning member were more food-secured than large ones. Flood, heavy rainfall, reduction of land productivity, crop damage by rat, lack of modern technology, salinity and high price of inputs were found to be livelihood risks for the coastal households.

Development of Population for Gynodioecious Papaya Variety: The study was undertaken to develop gynodioecious population for papaya variety containing 100% productive plant and to increase farm income through papaya cultivation was carried out at the Fruit Research Farm of Pomology Division, HRC, BARI, Gazipur. Sixteen germplasm from home and abroad were collected and included in the study. After flowering, only 22 plants were noticed as andromonoecious type. Among them 9 plants have been selected as superior in terms of yield and taste. Seeds of F_1 progeny were sown in seed bed on December 2013. Collection of new germplasm will be continued. Hermaphrodite flowers were covered with bag made by butter paper before opening of flower and then the bags were removed after fruit set. These fruits were tagged and harvested. These seeds were S1 progeny.

Bangladesh Jute Research Institute

Improvement of jute based cropping pattern & jute seed production techniques in southern areas of Bangladesh: The study has been undertaken to assess agro-economic performance of different of allied fibre varieties in the coastal salinity areas of Kalapara & Dumki under Patuakhali district and Amtali under Barguna district. Among the varieties, HC-95 performed better in respect of yield, gross return, gross margin as well as BCR. Four cropping pattern were studied like jute seed as a sole crop (T_1), Jute seed + Lalshak + Radish (Broadcast method) (T_2), Jute seed + Lalshak + Radish + Tomato (Line sowing with three pair method) (T_3), Jute seed + Lalshak + Tomato + Brinjal (Line sowing with three pair method) (T_4). Among the four cropping pattern, the maximum yield of jute seed was observed from T_1 880 kg/ha and 435 kg/ha in Kalapara and Amtoli respectively. The benefit cost ratio on full cost basis ranges from 1.09 to 4.51. The yield of jute in FA pattern was 2155 kg/ha with gross return (126300 Tk/ha) and BCR 1.66. Two farmers' training at Jute Research Sub-station, Kalapara, Amtoli and Dumki and one field-day were conducted.

Bangladesh Institute of Nuclear Agriculture

Development of short duration high yielding boro rice varieties through induced mutation: The first experiment included two mutant lines and the second experiment 06 mutant lines. In the first experiment, seeds of were sown 09 to 29 January and transplanted during 22 February to 08 March 2013 at 12 different locations of Bangladesh. In most of the locations, transplantation was made after harvest of long duration mustard/rapeseed. In the second experiment, seedlings were sown during 08 to 26 January and transplanted during 24 January to 26 February 2013 at four different locations. Both the experiments followed RCB design with 3 replications. The rice mutant RM (1)-200-(C)-1-17 was found more

suitable for late transplanting after harvest of long duration mustard/rapeseed as produced 17.04% more yield than BRRIdhan28 and also possess shorter plant height, lodging resistance, erect plant and leaves, shorter duration, and similar grain quality as the check variety. In the second experiment, the rice mutant RM (2)-40(C)-1-1-10 which produced comparable yield and matured 09 days earlier than the check variety BRRIdhan29.

Soil Water and Nitrogen Management for Sustainable Crop Production Using Tracer Technique in Drought Prone Areas of Bangladesh: The experiment was conducted at drought prone area, Godagari Upazilla, Rajshahi. Three treatments, W_1=Irrigation as Farmers practice, W_2 = Two irrigations (at CRI and before flowering /anthesis stage of wheat) and W_3=Three irrigations at CRI, flag leaf ligule emergence and before flowering /anthesis stage of wheat were assigned in the main plots and four N treatments, N_0=No nitrogen (control), N_1=50kg N/ha, N_2=100kg N/ha and N_3 =150kg N/ha were assigned in the subplots. For isotopic study, ^{15}N labeled nitrogen fertilizer (10.48% a.e.) was applied in the isotopic micro-plot. The highest yield was observed in the treatment combination W_3N_2 (4.97 t/ha), followed by treatment combinations W_2N_2 (4.09 t/ha), W_3N_3 (4.36 t/ha) and W_1N_3 (4.02 t/ha). Similar results were noticed in case of straw yield of wheat and the maximum and minimum values were recorded in the treatment combination W_3N_2 (6.64 t/ha) and W_1N_0 (2.74 t/ha), respectively. Different irrigation and N levels affected on the amount of N uptake in grain and straw of wheat. The maximum N uptake of 75.54 kg/ha was noticed in the treatment combination of W_3N_2, whereas, the minimum value (27.05 kg/ha) was found in W_3N_0 treatment. Regarding the N uptake in wheat straw, the highest (21.54 kg/ha) and lowest (5.75 kg/ha) values were noticed in the treatment combination of W_3N_3 and W_2N_0, respectively.

Soil Resource Development Institute

Organic Amendments for Upland Crops under Light Textured Soils in Char (OAUCC): The experimental was conducted Charharirampur union under Faridpur district. The soil was light textured and calcareous in nature. Cow-dung and poultry litter as organic amendment have applied to the field in the two successive crops with chemical fertilizers following IPNS. All inorganic fertilizers (P, K, S, Zn, B fertilizers) applied in full dose at final land preparation except N fertilizer. N-fertilizer was applied in three splits. Crops selected were BARI Wheat-24 (Pradwip) for Rabi season (winter) and Parijat, a local variety of B. aus for Kharif season. Fertilizer treatments in wheat field were: *T_1 [N:P:K:S:B=182.19:24.71:24.71:17.78: 3.36kg/ha + cow-dung=10ton/ha, Farmer's practice]; T_2 [N:P:K:S:Zn:B=140.50:35.50:45.50:18.00:3.35:0.8, Fertilizers application as recommended by FRG]; T_3 [N:P:K:S:Z:B=136.0:34.0:40.5:18.0:3.35 0.8+Cow-dung=3ton/ha]; T_4 [N:P:K:S:Zn:B=129.0:25.0:38.5: 18.0:3.35:0.8kg/ha + poultry litter=1.5kg/ha]*. Line sowing was followed for both crops. Irrigation was applied as necessary. The yield wheat was found highest in case of T_2 treated plots (6.11 t/ha) following T_4 treated plots (5.75 t/ha), T_3 treatment (5.25 t/ha) and the minimum from farmer's own practice (T_1, 4.48 t/ha). Organic amendment with cow-dung (IPNS) and poultry litter (IPNS) increased wheat yield compared to farmer's practice.

Effect of Different Hedge Species on Soil Erosion and Crop Yield at Different Hill Slopes of Chittagong Hill Tract: The hedges and their alley were selected such as indigofera, Bogamedula, Pineapple and Napier. The slopes are gentle slope, moderate slope and steeps slope. Yardlong bean and lady's finger were used as test crops. The different alley wind under each hedge species was 5m, 4m and 3m. Each plots containing 3 lines of hedge. The experiment was laid out in split plot design with three replications. Soil erosion was measured through spike lay out method. Fertilizers applied based on soil test value. Difference of total plants in each plot (control & managed by hedge) are directly influenced by alley width. Wider alley width gives a better yield performance. Species of hedge plants have a great effect on plant growth and crop yield. Hedge plant of low height (pineapple) provides a better performance than that of higher height hedge plant because it provides intensive light and better rooting. But higher height hedge plant provides more bio-mass than lower height hedge plants. Grass species (Napier) responses better than tree/shrub species (*Bogamedula and Indegofera*) on crop yield. Performance of pineapple among all other hedge species on crop yield and soil loss minimizing capacity was recorded the best on all slope gradients and alley width.

Bangladesh Agricultural University

Development of short duration high yielding rice varieties: The main goal of this research is to develop short duration, stable and high yielding rice varieties for Aus, Aman and Boro seasons to fit into the existing cropping patterns. Breeding line SL-9 and ADT(R) 47 were selected as donor (male) parent and BRRIdhan52, BRRIdhan53, BRRIdhan57 as recipient (female) parent for Aman season and

crosses were made among the selected parents. For Boro season, crosses were made in BRRIdhan28 X IR 77734-93-2-3-2, BRRIdhan29 X ADT(R) 47 and BRRIdhan55 X IR 77734-93-2-3-2. Crosses will be done in BRRIdhan48 X Parija, BRRIdhan55 X Parija,BRRIdhan48xNERICA2, BRRIdhan55xNERICA2, BRRIdhan48xNERICA 4, BRRIdhan55xNERICA 4 to obtain short duration high yielding Aus rice. The most promising ones will be selected from the hybridized generations following the modified pedigree method.

Production of Somaclone in vitro for Drought Stress Tolerant Plantlet Selection in Potato: Potato cv. Diamant and Asterix tubers were allowed to germinate on sand and shoot buds were explanted on MS medium with different PGRs to regenerate plantlets. Subsequently leaf, node and internodes of in vitro grown plantlets were used as explants. Combination of 2, 4-D and NAA at 2.0 mgL^{-1} was the best for callus induction and also for higher growth of induced callus. Combined effect of 2,4-D and NAA were always better than single effect. BA affected plantlet regeneration from callus and cent percent explants regenerated plantlet at 5.0 mgL^{-1} of BA. The highest number of shoot (3.0), length of shoot (8.0 cm), number of roots (20) and length of root (3.0 cm) were found at 5.0 mgL^{-1} BA supplemented medium over other treatments. Among the treatments of Kn and IAA, the highest percent (100) explants regenerated plantlets at 2.0 mgL^{-1} each and the lowest 50% was observed at 3.0 mgL^{-1} each. The highest number of shoots per explant, length of shoot, number and length of root were obtained with Kn^{+} IAA at 2.0 mgL^{-1} each supplemented BM. Thus, internode explant on MS medium supplemented with 2,4-D and NAA at 2.0 mg L^{-1} each was the best for callus induction and BA 5.0 mg L^{-1} or Kn + IAA at 2.0 mg L^{-1} each supplemented BM was suitable for callus derived plantlet production in potato.

An Integrated Approach for the Management of Wilts and Foot Rot/Collar Rot of Important Vegetables: *Trichoderma harzianum* CP (an IPM Lab strain) was formulated in grain brans at 22 different combinations. Lab bio-assay of *T. harzianum* CP against wilts and collar rot pathogens proved the antagonist completely inhibited the growth of *Fusrium oxysporum pv melongenae, Ralstonia solanacearum and Sclerotium rolfsii. Trichoderma* produced the maximum of CFU 6.100x 10^{8} per gram of black gram-peat soil mixture. The second highest CFU 6.090x108/g was produced in grass-pea peat soil mixture, third highest CFU 5.800x 10^{8} was in chickpea-peat soil combination. In the nethouse tray soil experiment, inoculated soil treated with formulated trichoderma @20g/Kg of soil ensured 82-87% seed germination in tomato, eggplant and Indian Spinach. The treatment reduced pre-emergence death to 13-20% and damping-off to 0.7-1.0%. The foot rot was completely checked by the treatment as against 10-13% in the inoculated tray. Soil treatment Formulated trichoderma @15g/Kg soil yielded better effect than the treatment@10g/Kg. Field trials with the formulated trichoderma are in progress.

Organic amendments for mitigating soil salinity in rice-maize cropping system: The field experiments were conducted at the farmer's field of Botiaghata, Khulna with aman and boro rice and maize crops. Four rice (salt-sensitive; BR-23, BRIS & BRRIdhan29 and salt-tolerant, Binadhan-8) and two hybrid maize varieties (BARI hybrid maize-5 and BARI hybrid maize-9) were used as plant materials. Proline was applied as a foliar spray at of 25 mL per plant at seedling and/or vegetative stages. Farmyard manure (FYM) and poultry manure (PM) were added to the soils during final land preparation. Salinity caused a significant reduction in growth and yield of T. aman and boro rice. BR-23 (aman rice) produced higher yield than other rice varieties under salinity conditions. Local cultivar Mohini produced the lowest yield under salinity conditions. Application of proline significantly increased growth, and grain and straw yields of both aman and boro rice under salinity conditions. Soil amendments with FYM and PM also increased grain and straw yields of rice during aman and boro seasons. There were no considerable variations in growth and yield of rice due to the different doses of proline and manures. Increased nutrient uptake and K^{+}/Na^{+} ratio in aman and boro rice were observed due to proline application and organic manures. Similar to rice, soil salinity significantly reduced the growth and yield of maize whereas application of proline and organic manures increased the growth and yield of maize under saline condition. Significant increases in nutrient uptake and K^{+}/Na^{+} ratio in maize were observed due to organic amendments with proline and manure.

Biological Nitrification Inhibition is a novel approach for enhancing nitrogen use efficiency in cereal production: Several sorghum species from home and abroad were surveyed for BNI capacity in roots using hydroponics. Among the tested sorghum varieties, none of the varieties showed detectable BNI capacity except hybrid sorghum from Japan. Several soil incubation studies were conducted to characterize the stability and ability of MHPP in the soil. The results revealed that MHPP is highly stable in the soil even up to 60 days and the significant amount of

MHPP was found in the incubated soil. NH_4^+ has the trigger (stimulatory) effect on BNI compound release from sorghum; and NH_4^+ uptake, Plasma membrane H^+-ATP-ase activity and rhizosphere acidification may be functionally interconnected with BNI release in sorghum. The further results of the field and pot experiments indicated that the inhibitor (i.e. MHPP) may effectively inhibits nitrification process and improves nitrogen use efficiency by improving growth and yield parameters of rice.

Remote Controlled Guti Urea Applicator: The application of *guti* urea requires 25-35% less urea with one round application per crop than that of traditional hand broadcasting method. On the other hand, yield of rice increases by 15-20 % with the use of guti urea applicator. However, placement of *guti* urea below the soil surface is a laborious, back breaking work for farmers. Furthermore, farmers have to walk hard across the muddy field many times which make them unwilling to work. With a view to solve the above difficulties and to provide more comfort to farmers, this research project has been initiated to develop a remote controlled *guti* urea applicator that could place *guti* urea efficiently. The necessary component of the devices such as metering unit, the chassis, furrow opener and furrow closer have been designed and fabricated. The first version of the device is now ready for assembling. The work progress is satisfactory and is on planned schedule.

Study on Fish Disease and Health Management in Rural Aquaculture: Twelve bacterial isolates were collected from the sampled fish. Primary identification and characterization of bacterial isolates included Gram's stain, motility test, oxidase test, O-F test, 0/129 and antibiotic sensitivity tests. Further characterizations were accomplished using API-20E microbial identification kit. All the isolates were identified as *Aeromonas hydrophila*. They were mostly recovered from kidney and lesion of affected fishes. Hemorrhageic lesion over body surface especially in mouth and caudal region and rectal protrusion in pangas were associated with the bacterial infection. Internally, kidney, liver and spleen were swollen and enlarged. The pathogenicity of the bacterial isolates has also tested by injecting fish intramuscularly with bacterial suspension. As part of treatment trail, the effects of six antibiotics have been examined with experimentally infected fish. Variations were found with the effect of the antibiotics on infected fishes. The pathology associated with bacterial infections has also been studied. The aeromonad isolates varied with their pathogenicity but showed similarity in antibiotic sensitivity.

Study of reproductive endocrinology of mud eel Monopterus cuchia for artificial propagation: Fish samples were collected from *haor* and *beel* areas of Mymensingh and Netrokona districts. The highest GSI of 6.002±1.672% was observed in mid May and lowest of 0.232±0.015% in September. This indicated that the peak breeding season of mud eel was from late April to early May. Monthly observation of ovarian gametogenesis utilizing routine haematoxylene-eosin protocol identified presence of undeveloped oocyte (UO), oogonium (O), early perinucleolar oocyte (EPNO), late perinucleolar oocyte (LPNO), previtellogenic oocyte (PVO), yolk vesicle (YV), yolk granule (YG), premature (PM) and mature (M) stages of oocytes in ovary samples from different seasons. In this study, the mature stages of oocytes (PM and M oocytes) were found from April to June samples of ovary, indicating the spawning season of *M. cuchia.* The ovaries contained developing oocytes (UO, EPNO, and LPNO) from July to February, indicating spent and resting phases of ovary during these months. Fecundity was measured for a period from mid March to mid May and ranged between 132 (body weight 240g) to 461 (body weight 380g). The highest fecundity was observed in mid April and the lowest was in mid May. Ova diameter was highest in mid May and lowest in mid April. The most distinct feature to separate the both sexes was shape of their genital papilla.

Production of Genetically Male Tilapia by Identification of YY Supermales Using Microsatellite DNA Markers: The study aims at the production of genetically male Nile tilapia using such markers. The production of YY males in conventional way and identification of those supermales by the sex-linked markers is the target of the present study. Hormonal sex reversal of mixed sex has been performed to obtain XY neofemales. The aceto-carmine gonad squashing method can be employed to detect the percentage of sex-reversal rate to continue breeding between XY neofemales and XY normal males to get 25% YY progeny.

Development of breeding and fry rearing techniques of endangered Tengra, *Mystus vittatus* and Gulsha, *Mystus cavasius*: Both the fish species were successfully domesticated in captive condition and growth and breeding related parameters such as GSI, fecundity etc. were studied. The fecundity of *tengra* was ranged from 8346 to 42253 in May and 9073 to 22705 in June. Similarly, the fecundity of *gulsha* was ranged from 4752 to 7776 in May and from 7413 to 16331 in June. Partial GSI study

revealed that both the species breeds in monsoon season i.e. starts from April and breeding season can be extended for next few months. Six month GSI values revealed that April is the pick time for tengra and June for *gulsha* for breeding. Artificial breeding trials were conducted using carpPG extract with three different dosages (2 & 6, 4 & 8, 6 & 10 mg/kg b.wt. for male and female respectively) and 2 & 6 mg/kg b.wt. of carpPG extract produced best results. In case of tengra, about 62-85% fertilization and 55-70% hatching were obtained while 64-80% and 57-71% fertilization and hatching were recorded from gulsha respectively. Hatchlings of *tengra* and *gulsha* are being reared in aquarium and tray with supplemental feed such as hard boiled egg-yolk, tubifex, and plankton and their rearing techniques will be developed through experimental trials.

Increasing nitrogen use efficiency through nitrogen and water management in the rice-rice cropping pattern: The fertilizer experiment consisted of 7 treatment combinations of different forms of urea fertilizer (Prilled urea (PU), and USG 1.8g & USG 2.7g) and cowdung. Split application of PU instantly increased porewater NH_4-N and NO_3-N and came down to ground state after 6 days of application during the all three splits of PU. USG application specially 78 kg N/ha from USG (1 x 2.7 g/4 hills) generated available NH_4-N and NO_3-N slowly rather spontaneously over a long time indicating a beneficial role of USG over PU. The application of USG alone or in combination with organic manure performed significantly better in terms of yield and yield parameters compared to 100% dose of PU. The fertilizer and water management experiment was laid out in split plot design using water in the main plot and fertilizer N in the subplot. The two water regimes, AWD and CF used in the experiment did not show marked variation in growth and yield of rice. The water management had some problem due to three dimensional movement of water. Like the fertilizer experiment the USG alone or in combination with cowdung gave better yield. The highest grain yield of 5.5 t/ha was recorded in BRRIdhan29.

Sher-e-Bangla Agricultural University

Influence of fertilizer, manure and water management on soil fertility, nutrient availability and productivity under Rice-Rice cropping system: Two experiments were conducted in the farm of Sher-e-Bangla Agricultural University farm, Dhaka, Bangladesh during July 2012 to June 2013. BRRIdhan32 and BRRIdhan29 were used as the test variety for boro and T. Aman season. The two rice-rice cropping experiments are being conducted in the same 48 (8 fertilizer x 2 irrigation x 3 rep.) and 72 (8 fertilizer x 3 irrigation x 3 rep.) plots. The yield parameters, yields and nutrient concentrations of grain, straw were significantly affected by fertilizer and manure but not significantly influenced by different irrigation treatments. In the second crop T. Aman rice and 3rd crop boro rice, the higher grain and straw yields were found in T_7 (70% NPKSZn+2.1 ton poultry manure/ha) treatment in both experiments and the interaction effects of fertilizer and irrigation were not significantly influenced the yield and yield parameters. The pore-water nutrient availability was also affected by fertilizer and irrigation treatments. Higher grain yield and grain NPKS concentrations were found in the fertilizer treatments where pore-water nutrient concentrations were higher.

Sylhet Agricultural University

Development of artificial breeding techniques of *Sperata aor:* Brood fish were collected and reared in the research ponds both on station (Research ponds in the Sylhet Agricultural University campus) and on farm (American fish farm Ltd. at Zakigonj) for nine months. To examine the monthly changes in the gonads for estimating spawning season, the GSI was calculated by: GSI = (Weight of gonads/weight of fish)X100. The average length and weight of the *S. aor* fry became 27 cm and 148 gm, respectively on station in April. While on the farm it became 39 cm and 700 g, respectively. On the other hand, average length and weight of the brood became 34 cm and 500 g, respectively on station. While on the farm it was 45 cm and 1000 gm, respectively. The brood fishes reared in on-station ponds did not perform natural breeding yet. On the other hand, natural breeding of *S.aor* was observed in on farm in captivity. The GSI of female was found to be decreasing from October to February and lowest was recorded on December. It was found to be increasing from February to May. On the other hand, the lowest GSI (Gonado-somatic Index) value of male was found in Nov and after that it was gradually increasing and the highest was observed in May.

Adaptation of heat tolerant tomato and photo insensitive country bean variety during summer season in Sylhet region: Four heat tolerant tomato hybrids and four photo insensitive country bean lines were included in this study from the study 150g hybrid seed of BARI Hybrid tomato-4 and 850 g seeds of one photo-insensitive country bean line were produced during winter season of 2011-12 for further evaluation and demonstration in the farmer's field. Seeds of other varieties were collected from BARI

for evaluation under Sylhet condition. One trainers training comprising DAE, BADC and NGO personnel and two farmers training comprising 20 farmers each were organized on summer tomato and summer bean production technology during April/May 2012. Summer tomato and summer country bean seeds and other logistic support were given to 30 farmers of Sylhet and Moulavibazar districts for field demonstration. On station evaluation of 4 photo-insensitive country bean lines and 4 heat tolerant tomato hybrids were started from the month of April and May 2012, respectively in the experimental field of Sylhet Agricultural University. Fruit bearing status of tomato and country bean lines are very encouraging both in on station and on farm demonstration. Harvesting of ripe fruit of tomato and green pod of country bean is going on in regular interval and necessary information regarding yield and yield attributes are collecting properly for interpretation of the results.

Monitoring of Programmes/Activities

Nine teams were formed with the scientists of BARC for field monitoring of the research/technologies transfer programs carried out during the period of 2012-13. The teams were assigned to visit and monitor the BARC funded research/technologies transfer programmes implemented by different NARS and associate institutes. The following table presents the team composition, monitoring regions, organization visited:

Team Composition for Field Monitoring of Research activities under Research Grant Fund of BARC

Team No.	Location	Institutes Involved	Project-No.	Team Composition
1.	Gazipur	BARI (Gaz.)	1,2,4,8,9	Dr. Md. Ahmad Ali Hassan, MD (NRM)- Team Leader Dr. S.M. Bokhtiar, PSO (Soils)-Member Dr. Fauzia Yasmin, PSO (TTMU)-Member
2.	Gazipur Dhaka	BARI (Gaz.),BSMRAU (Gaz.),SAU (Dha.)	26,27,32, 36, 37	Dr. M. K. A Chowdhury, MD (Crops)-Team Leader Dr. Md. Abul Kashem, Director (PIU-BARC)-Member Dr. S. M Khorshed Alam, PSO (Crops)-Member
3.	Sylhet Bandarban	Syl –AU(Syl),Syl –AU (Zaki), SRDI (Band.)	29,30,31	Dr. Meraz Uddin Ahmed, MD (A&F) - Team Leader Dr. Md. Abdus Salam, PSO(P&E), -Member Mr. Md. Mustafizur Rahman, STO- Member
4.	Jamalpur Sherpur Mymensingh	BARI (Jam. Sher.), BINA(Mym), BAU(Mym)	3,12,14,15, 16,18,19	Dr. Kabir Ikramul Haque, MD(Fish)-Team Leader, Mr. Md. Aminuzzaman, Director (M&T)-Member, Dr. Shah Md. Ziqrul Haque Chowdhury,CSO (Livestock)-Member
5.	Mymensingh	BAU (Mym)	20,21,22, 23,24,25, 33	Mr. Md. Abeed Hossain Chowdhury, Director (Computer)-Team Leader; Dr. Abul Kalam Azad, CSO (Crops); Dr. Monirul Islam, Director (Nut)–Members
6.	Faridpur Rajbari Magura Khulna	BAU (Khul.), BARI (Far., Raj.)SRDI (Far.) BINA (Mag.)	6,12,17,28	Dr. S. M. Khalilur Rahman, MD (AERS) -Team Leader Dr. M. A. Satter, CSO (Soil) - Member Dr. Md. Baktear Hossain, PSO (Soils) -Member
7.	Bogra Rajshahi, Natore	BARI (Raj.), BINA (Nat., Bog., Raj.)	7,11,13	Dr. Sultan Ahmed, CSO (Agril.Eng.)-Team Leader Dr. A.S.M Anwarul Huq, CSO (AERS)- Member Mr. Md. Abdul Mottakin, Senior AD - Member
8.	Burirhat Rangpur Dinajpur	BARI(Buri.),BINA (Rang.),HDSTU(Dinaj.)	1,12,34	Dr. Paresh Chandra Golder, MD(P&E) -Team Leader Dr. Mian Sayeed Hassan, PSO (Crops)-Member Mr. Ajit Kumar Chakrabarty, DD(Accounts)- Member
9.	Barisal, Patuakhali Bhola	BARI (Bar.), BJRI (Pat.), BINA (Bar, Bho.)	5,13, 14,15	Ms. Dil Afroz, Director (AIC)- Team Leader Dr. Mohammed Shahjahan, CSO (Forestry)- Member Dr. M. A Awal, PSO (P&E)-Member Md. Mahbubul Hassan, Senior AD(Admin.)- Member

Field Monitoring Report of Research Grant of BARC

Monitoring Report of Team-1: The team 1 consists of Dr. A. A. Hassan, MD (NRM), Dr. S. M. Bokhtiar, PSO (Soil) and Dr. Fauzia Yasmin, PSO (TTMU) visited Bangladesh Agricultural Research Institutes (BARI), Gazipur on 22 and 23 January 2013. Five research projects were monitored:

S N	Title	Impl. Inst.	Name of PI's
1	Integrated Management of Banana Diseases incited by Fungi and Nematode	BARI	Dr. Md. Abdur Rahman, CSO, HRC

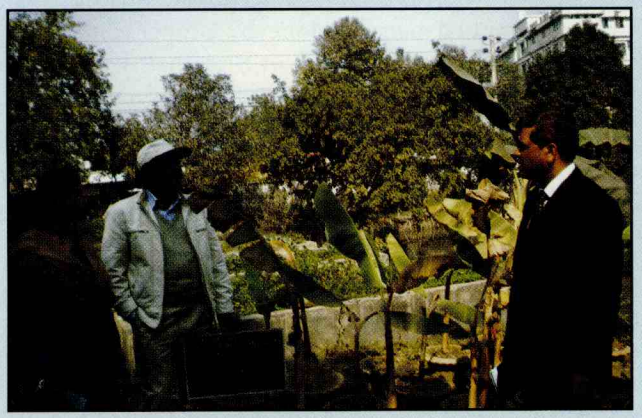
2	Development Technology for production of seedless fruits of guava and lemon in off season through application of GA_3 at floral bud	BARI	Dr. Md. Al-Amin Hossain Talukder, SSO, HRC
3	Improvement of gladiolus quality and its adoption	BARI	Dr. Kabita Anzu-Man-Ara,SO, HRC
4	Study on Rural Household's Food Security in Coastal Region of Bangladesh	BARI	Moniruzzaman, SSO, AED
5	Development of packages for fruits (Mango, Banana) and vegetables (Yard Long Bean, Pointed gourd, Okra)	BARI	Mohammad Mizanur Rahman, SSO, PHT

Integrated Management of Banana Diseases Incited By Fungi and Nematode

1. Objectives: (i) To Identify the disease incidence and damage for panama in major banana growing areas in the country (ii) To isolate, purify and preservation of the panama causing fungus (iii) To find out the effective control measure against panama disease in lab and pot(iv)To adopt the most effective control measure for panama, sigatoka and nematode in farmer's orchard(v)To develop a IPM package technology for banana production.

2. Implementing Agency: HRC, BARI, Gazipur, Principal Investigator: Dr. Md. Abdur Rahman, CSO, HRC, BARI, Gazipur, Implementation locations: For Survey: Jessore, Bogra, Rangpur, Tangail, Mymensingh, Narsingdhi and Pirojpur, For Control Measure: Jessore, Bogra, Rangpur and Tangail.

3. Budgetary Information: i) Approved cost: Tk. 3,00,000/-, ii) Fund released: Tk. 1,50,000, iii) Fund spent: Tk. 1,27,287.5.



Dr. S. M. Bokhtiar, PSO (Soil) and Dr. Fauzia Yasmin, PSO (TTMU) visited the experimental field of banana and consulted with Dr. M.A. Rahman, CSO, BARI

4. Implementation Progress of Research Activities: Survey the major diseases of banana: 60% area surveyed and disease data recorded; Panama wilt control in pot culture study using Sabri variety:Set up; Control of burrowing nematode (*Rodophilus similis*): Set up.

5. Persons interviewed: Date of visit: 2.1.2013: Constraints: Survey for banana wilt need to be done from July to October to record severity of the disease. Suggestions: Waiting for next season to continue and complete the portion of research.

6. Persons and Observations during monitoring: Overall performance was Satisfactory; Survey for banana wilt need to be done from July to October to record severity of the disease, that is why needs to wait for the next season to continue and complete the portion of research.

Development of Technology for Production of Seedless Fruits of Guava and Lemon (Mini Elachi Lebu) in off Season Through Application of GA_3 at Floral Bud

1. Objectives: (i) To determine the effect of different concentration of GA_3 on floral buds of guava and lemon on fruit quality and yield (ii) To determine the bud maturity at which GA_3 influences fruit set growth and development.

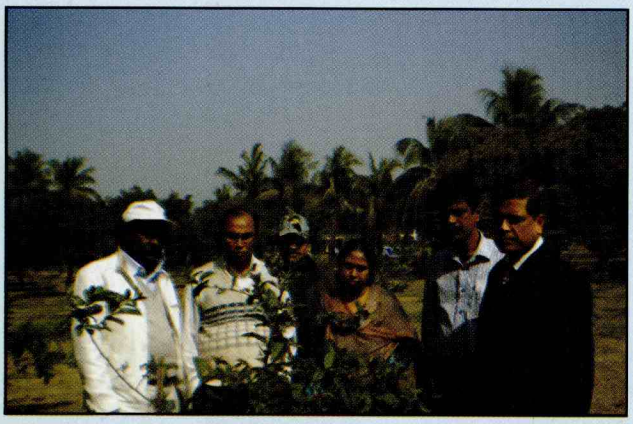
2. Implementing Agency and Division/Section: HRC, BARI, Gazipur, Principal Investigator: Dr. Md. Al-Amin Hossain Talukder, SSO, Pomology Division. HRC, BARI, Gazipur, Implementation locations: a) Fruit Research Farm, HRC, BARI, Gazipur b) RARS, Akbarpur, Moulvibazar.

3. Budgetary Information: i) Approved cost:Tk. 2,75,000/- ii) Fund released: Tk. 1,37,500, iii) Fund spent: Tk. 1,15,860.

4. Implementation Progress of Research Activities

Expt 1: Effect of GA_3 on mini elachi lebu to induce seedless fruit: Procurement of research inputs: Necessary inputs were collected timely: Satisfactory;
Experiment establishment: Saplings were planted in the fruit research farm, HRC, BARI, Gazipur, May 2012. GA3 were applied as per treatment: Satisfactory;
Management: Irrigation, weeding, fertilizer and plant protection measures applied timely: Satisfactory;
Results: Seedless fruits were found: Satisfactory.

Expt 2: Effect of GA_3 on guava to induce seedless fruit: Procurement of research inputs: Necessary inputs were collected timely;
Experiment establishment: GA3 were applied as per treatment on the established guava orchard, October 2012; Management: Irrigation, weeding, fertilizer applied timely and plant protection measures were done timely; Results: Results not satisfactory. In Kazi peara having profuse seeds in their fruit. So concentration of GA3 should be increased.



The team visited the experimental field of guava and consulted with Dr. Md. Al-Amin Hossian Talukder, SSO, BARI

5. Persons interviewed: Date of visited: 2.1.2013: Persons interviewed: Dr. Md. Al-Amin Hossain Talukder, SSO, Pomology Div. HRC, BARI, Gazipur Constrainits: Orchard of mini elach lebu is not established yet at HRC/BARI. Suggestions: Try to establish mini elachi lebu Orchard at HRC/BARI as early as possible.

6. Persons and Observations during monitoring: Overall performance is Satisfactory; Mini elachi lebu garden is trying to establish at HRC, BARI under this project; A positive response for seedless lemon was found. But in case of guava, the present concentration of GA_3 application did not show any seedless guava.

Improvement of Gladiolus Quality and its Adaptation

1. Objectives: (i) To improve flower and corm quality (ii) To disseminate BARI released gladiolus varieties (iii) To increase yield per unit area and farmers income.

2. Implementing Agency and Division/Section: Floriculture Division, HRC, BARI, Gazipur, Principal Investigator: Dr.Kabita Anzuman Ara, PSO, Floriculture Division, HRC,BARI, Gazipur, Implementation locations: i) HRC, BARI, Gazipur, ii) Horticulture/Agricultural Research Station of BARI, such as Burrirhat (Rangpur), Sonatola (Bogra) and Godkhali (Jessore).

3. Budgetary Information: i) Approved cost: Tk. 3,19,000/- ii) Fund released: Tk. 1,59,500, iii) Fund spent: Tk. 1,09,847.

4. Implementation Progress of Research Activities Expt 1: Performance study of promising gladiolus genotypes for yield and quality: Land preparation: The experimental land was well prepared for successfully setting up of experiment; Materials and input collection: Necessary steps for procurement were taken by proper authority for making availability of materials any input in time; Setting up experiment: This experiment was set up at floriculture research field of HRC, BARI, Gazipur; Intercultural operation: Weeding, mulching, earthing up, disease, insect-pest management, watering etc. were done as and when necessary.

Expt 2: Effect of corm size and growth regulators on flowering and corm production in Gladiolus: Land preparation: The experimental land was well prepared for successfully setting up of experiment; Materials and input collection: Necessary steps for procurement were taken by proper authority for making availability of materials any input in time; Setting up experiment: This experiment was set up at floriculture research field of HRC, BARI, Gazipur; Intercultural operation: Weeding, mulching, earthing up, disease, insect-pest management, watering etc. were done as and when necessary.

Expt 3: Effect of boron and zinc on the yield of gladiolus: Land preparation: The experimental land was well prepared for successfully setting up of experiment; Materials and input collection: Necessary steps for procurement were taken by proper authority for making availability of materials any input in time; Setting up experiment: This experiment was set up at floriculture research field of HRC, BARI, Gazipur; Intercultural operation: Weeding, mulching, earthing up, disease, insect-pest management, watering etc. were done as and when necessary.

5. Implementation Progress of Research Activities: Adaptive trial of different varieties of gladiolus at farmer's field: Selection of site and farmers: Selected on farmers' interest, target group, feasibility and suitability of the land; Arrange of training: 30 farmers; Procurement of necessary inputs and distribution: Corm, manure, fertilizer, insecticide, fungicide, netted bag etc done by proper authority; Set up of demonstration trial: At Burrirhat (Rangpur), Sonatola (Bogra) and Gadkhali (Jessore) on 20-30th Nov, 2012; Cultural practices: Weeding, manuring, mulching, watering, disease and insect-pest management; Data collection: Data will be collected on yield and yield contributing characters, farmers reaction, benefit cost ratio etc.; Monitoring: Time to time visit were done by the scientists.

Study on Rural Household's Food Security in Coastal Region of Bangladesh

1. Objectives: i) To investigate the rural household's access to food in terms of food production, household income, asset ownership and income diversification of farm and non-farm households ii) To estimate the existing rural household's food status in the coastal region iii) To explore the coping strategies of coastal people during stress situation and iv) To suggest some policy guidelines for enhancing coastal peoples living status.

2. Implementing Agency and Division/Section: Agricultural Econ. Div., BARI, Gazipur, Principal Investigator: Mr. Moniruzzaman, SSO, Agricultural Eco. Div., BARI, Gazipur, Implementation locations: Bhola, Patuakhali and Barguna.
3. Budgetary Information: i)Total approved cost:Tk. 2,47,500/-,ii) Fund released: Tk. 1,23,750.
4. Implementation Progress of Research Activities: Site selection and questionnaire preparation: Completed; Data collection: Data were completed on March, 2013; Review of literature and desk work: Completed; Compilation Report: April to May/2013 June/2013; Site selection and questionnaire preparation: Completed. Delay release of fund hindered the activites.

Development of Packages for Fruits (Mango, Banana) and Vegetables (Yard Long Bean, Pointed Gourd, Okra)

1. Objectives: (i) standardize the packages of selected fruits (mango, banana) and vegetables (yardlong bean, pointed gourd, okra) at farmers, traders and retailers level, (ii) Quality evaluation of fruits and vegetables in the packages.
2. Implementing Agency and Division/Section: Post Harvest Technology, BARI, Gazipur, Principal Investigator: Mohammad Mizanur Rahman, SSO, PHT, BARI, Gazipur, Implementation locations: BARI, Gazipur.

The team visited the Postharvest Technology Division of BARI and discussed with the PI and other scientists of the Division

3. Budgetary Information: i) Approved cost: Tk.11,87,000 ii) Fund released till monitoring: Tk.1,98,000, iii) Fund spent: Tk. 67,187.50.
4. Implementation Progress of Research Activities: Input collection: Nested and non-nested plasticscrates collected from local producer, and Cartoon: wooden box and corrugated fibre box (CFB) design and developed for the study, Cushioning materials: foam net, plastic film and Low & high density polyethylene collected from local markets. Collection of fresh fruits and vegetables: Matured mango: Bholar Hat, Chapai Nawabgonj, Yardlong bean; Norshingdi.
Experiment conducted: First Trial: for yardlong bean and mango, 2 experiments for evaluating packages and keeping quality, Data recorded (yardlong bean): Color, firmness, gases inside the packet, shelf life physicochemical parameters. Overall performance was satisfactory.

Monitoring Report of Team-2: The team members were Dr. Md. Khalequzzaman Akanda Chowdhury, MD (Crops), Dr. Md. Abul Kashem, Director (TTMU), BARC and Dr. S. M. Khorshed Alam, PSO (Crops). Monitored following five projects at SAU Farm, Sher-e-Bangla Nagar, BARI Joydebpur, Gazipur and BSMRAU during 22-23 March 2013:

Influence of fertilizer, manure and water management on soil fertility, nutrient availability and productivity under Rice-Rice cropping system

1. Objective(s): (i) Integrated use of fertilizer and manure with different water management on the yield and quality of Boro and T. Aman rice (ii) Fate of applied N, P, K, S fertilizer and manures in irrigated rice soil with different water management (iii) To know the organic matter accumulation at various depths of paddy soil resulting from the addition of different level of manure and fertilizer with different levels of irrigation practices.
2. Implementing Agency & Division/Section: Soil Science Department, Sher-e-Bangla Agricultural University, Programme Leader: Dr. Md. Asaduzzaman Khan, Professor, Dept. of Soil Science, SAU, Dhaka, Implementation Locations: Sher-e-Bangla Agricultural University Farm, Sher-e-Bangla Nagar, Dhaka-1207.

3. Major Activities:

	Planned Activities	Implementation Status
1.	Integrated use of fertilizer and manure with different water management on rice yield, soil fertility and nutrient availability under Rice-Rice cropping system	This experiment was started at SAU farm in December 2011. There were eight fertilizer treatments and three water management treatments. The experiment was laid out in split-plot design with a distribution of irrigation to the main plots and fertilizers to the sub-plots. The boro rice (BRRIdhan29) was grown properly in 72 plots and harvested. After harvest, the yield and yield parameters were recorded. The grain, straw samples were analyzed for N, P, K and S. After harvest boro rice (1st

		crop), 2nd crop T. Aman rice was grown in the same 72 plots during July-Nov. 2012 and yield and yield parameters were recorded. The grain straw samples were analyzed for N, P, K and S. After harvest 2nd crop, treatment wise fertilizer and manure were applied in the same plots and 3rd crop boro rice was transplanted during January 2013. During monitoring, the crop was at the panicle initiation stage.
2.	Fate of organic and inorganic fertilizer in paddy soil with different water management under rice-rice cropping system	The experiment was started at SAU farm, Dhaka. The first crop Rice (BRRIdhan29) was grown in 48 plots (8 fertilizer and manure treatments x 2 different levels of irrigation x 3 replications). There were eight fertilizer treatments and two water management treatments. The experiment was laid out in split-plot design with a distribution of irrigation to the main plots and fertilizers to the sub-plots. A PVC core (50 cm length and 20 cm diameter) was installed upto 40 cm depth in the middle of each plot and rice was not grown into the core. Pore-water samples were collected from inner and outside of the cores by using rhizon sampler (Rhizon MOM 10 cm length, 2.5 mm OD, Rhizosphere Research Products, Wageningen, and The Netherlands) during the different dates of rice growing periods. The pore-water samples were analyzed for N, P, K and S contents. After harvest, the yield and yield parameters were recorded. After harvest first crop, 2nd crop T.Aman (BRRIdhan33) rice was grown in the same plots during July-Nov. 2012 with fertilizer and manure application. The yield and yield parameters were recorded and grain, straw were analyzed for N, P, K & S. After harvest 2nd crop, treatment wise fertilizer and manure were applied in the same 48 plots and 3rd crop boro rice was transplanted during January 2013 and the crops are in panicle initiation stage. The pore-water are being collected and analyzed for N, P, K and S.
3.	Data Collection	The data of yield and yield parameters of two experiments were recorded and statistically analyzed by MSTAT-C.
4.	Soil, Plant and Water Sample Analysis	The soil, plant and water samples were analyzed for N, P, K and S and statistically analyzed by MSTAT-C.
5.	Future activities	After harvest 3rd crop boro rice, 4th crop T. Aman rice and last crop (5th crop) Boro rice will be grown in the same plots of both experiments and yield and yield parameter data will be recorded. The pore-water, grain and straw samples will be analyzed for N, P, K and S. Then post-harvest soil samples will be analyzed for pH, OC, N, P, K and S.

3. Budgetary Information: i) Approved Budget Tk: 12,00,000/- ii) Fund released Tk: 7, 00,000/-, iii) Fund spent Tk: 6, 81500/-.

Evaluation of New Plant Type (NPT) advanced lines of rice for Amon season as high yielding varieties

1. Objective (s): i) Evaluation of NPT advanced lines for released as variety(s) (ii) Maintain of restorers and maintainers from NPT lines for development of inter sub-specific hybrids (super rice).

2. Implementing Agency: Gen. and Plant Breed., SAU, Dhaka-1207, Programme Leader: Dr. Md. Sarowar Hossain, Professor, SAU, Dhaka-1207, Implementation Locations: i) Secondary Yield Trial and Seed Multiplication, Amon Season (2011): Research Farm, Shere Bangla Agricultural University, Dhaka, Boro Season (2011-2012): Research Farm, Shere Bangla Agricultural, University, Dhaka ii) Regional Yield Trial (Aman season 2012), SAU Research Farm,Dhaka; BRRI, Gazipur; Rajshahi Regional Research Institute of BRRI,Rajshai, Rangpur Regional Research Institute of BRRI, Rangpur, Comilla Regional Research Institute of BRRI, Comilla, Kushtia Regional Research Institute of BRRI, Kushtia iii) On Farm Trial at different AEZs (Amon season 2012), SAU Research Farm, Dhaka; BRRI, Gazipur; Rajshahi. Regional Research Institute of BRRI, Rajshai, Rangpur Regional Research Institute of BRRI, Rangpur, Comilla Regional Research Institute of BRRI, Comilla, Kushtia Regional Research Institute of BRRI, Kushtia.

3. Major Activities

Sl#	Planned Activities	Implementation Status
Amon season 2011 (July 2011 –Nov 2011)		
1.	Selected NPT lines will be evaluated as Secondary Yield Trial (SYT) by replicated yield trial	Selected 7 NPT lines were grown and yield per plant & yield/m^2 were evaluated in RCBD design with two standard check varieties.Promising 5 NPT lines were selected for Regional yield trial
2.	Quality characters of selected NPT lines will be evaluated	Quality characters of selected 7 NPT lines including two checks were evaluated
3.	Continuation of improvement of restorer lines by selfing and pedigree selection	5 selected restorer lines were grown and healthy and morphologically better plats were selected for selfing. Selfed seeds of restorer lines were collected

		for further improvement in the next Boro season.
4.	Continuation of conversion of good maintainers into new CMS line by back crossing method	3 promising maintainer lines were back crossed (BC_4F_1) for conversion into new CMS lines. Seeds were collected from both female parent (BC_5F_1) and pollen parent and back cross will be continued coming Boro season 2011-2012.
Boro Season 2010-2011 (December 2011 - June 2012)		
1.	Seed multiplication of selected NPT lines will be done for Regional Yield Trial (RYT)	Seed multiplication of selected 5 NPT lines is going on for Regional Yield Trial
2.	Continuation of improvement of restorer lines by selfing and pedigree selection	5 selected restorer lines were grown and healthy and morphologically better plats will be selected for selfing. Selfed seeds of restorer lines will be collected for further improvement in the next Amon season.
3.	Continuation of conversion of good maintainers into new CMS line by back crossing method	3 promising maintainer lines will be back crossed for conversion into new CMS lines. Seeds will be collected from both female parent (BC_6F_1) and pollen parent and back cross will be continued coming Amon season 2012.

4. Budgetary Information: i) Approved Budget Tk: 9,00,000/- ii) Fund released Tk: 1,71,000/- iii) Fund spent Tk:1,50,000/-.
5. Name of the Respondent(s)/Persons interviewed: Dr. Md. Sarowar Hossain, Professor, Dept. of Genetics & Plant Breeding, SAU, Dhaka-1202.

Development of population for gynodioceious papaya variety

1. Objectives: i) To develop variety containing 100 productive plant and ii) To increase farm income through papaya cultivation.
2. Implementing Agency: Pomology Division, HRC, BARI, Gazipur. Name & Designation of the Programme Leader: Dr. Madan Gopal Saha, CSO, HRC, BARI, Gazipur, Implementation Locations: BARI, Joydebpur, Gazipur.

3. Major Activities:
Identification and collection of hermaphrodite germplasm from domestic and exotic sources: completed; Evaluation, characterization and selection of superior lines: completed; Selfing of selected gynodioecious lines: completed; Crossing of selected female lines with hermaphrodite lines and evaluation of F1 progeny: completed; Procurement of office stationary: completed; Procurement of research inputs: completed; Field research expense: i) Hiring labor ii) Field day: completed.

4. Budgetary Information: i) Total Approved Budget Tk. 9.00 Lacs; ii) Fund released up to 11 March 2013 Tk. 1,75,000/- iii) Fund spend up to 11 March 2013 Tk. 57,800/-.
5. Constraints & Suggestions: Lack of availability of hermaphrodite papaya germplasm: Collection of hermaphrodite papaya germplasm should be increased from local and exotic sources; Inadequate trained manpower for developing gynodiocious papaya variety: Higher training in abroad should be provided to the scientists.
6. Name of the Respondent(s)/Persons interviewed: Dr. Madan Gopal Saha, CSO, Pomology, HRC, BARI, Gazipur-1701.

Integration of fish culture with hydroponic agriculture system for alternate rural livelihoods

1.Objective (s): (i)To identify suitable vegetable crops and aquaculture species for integrated hydroponic-aquaculture system (ii) To optimize the vegetable growing system and fish stocking density in an integrated hydroponic-aquaculture system (iii) To assess the production income efficiency of integrated hydroponic-aquaculture system in selected water logged areas.
2. Implementing Agency & Division/Section: Department of Fisheries Technology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur.
3. Name & Designation of the Programme Leader with address: Professor Dr. Md. Jahangir Alam, Department of Fisheries Technology, BSMRAU, Gazipur 1706, Implementation Locations: BSMRAU and water logged area around.
4. Major Activities and Achievements:
Site selection: Complete; Preparation for pond and floating vegetable beds: Complete; Preparation of experimental units: Complete; Set up experiment: Complete; Conduct experiment: On progress; Farmers' training: Not in the 1st Yr; Monitoring & evaluation: One field monitoring by BARC has been done; Data analysis and reporting: On progress.
5. Budgetary Information: i) Total Approved Budget: Tk.9, 00,000/- ii) Fund released (to date): Tk. 2, 25,000/- ii) Fund spent (to date): Tk.1, 28,190/-.
6. Constraints & Suggestions: It was planned to set up the experiment in pond in the BSMRAU campus, which has a connection for continuous water flow. But at the preparation stage it was noticed that the pond is having some waste water from nearby garments factory. This has compelled the researchers

to set-up the experiment in the pond complex of the Faculty. As the water is stagnant and closed, has been found to becoming brownish, possibly due to decomposition of water hyacinth and other organic materials that has been used for vegetable bed preparation: Observing the situation and discussing with the research team, the monitoring team suggests to select a suitable running water area to conduct the experiment in the 2nd year, it has been planned in the onwards. Construction of vegetable bed needs huge amount of water hyacinth: The problem would be solved by selecting the area where the floating bed vegetable production practices are in place.

7. Name, of the Respondent(s)/Persons interviewed: i) Dr. Md. Jahangir Alam, Professor and Principal Investigator, Department of Fisheries Technology BSMRAU, Gazipur-1706; ii) Mr. Md. Shakhawate Hossain, Lecturer & Co-investigator Department of Fisheries Biology and Aquatic Environment BSMRAU, Gazipur-1701.

Export and Import Analysis of of Selected Vegetables and Spices in Bangladesh

1. Objectives: i)To find out export potentialities of selected vegetables in the different locations in the country; ii)To estimate the import substitution status of the selected spices crops; iii) To examine the policy implications arising from the findings.
2. Implementing Agency:Agricultural Economics Division, BARI, Gazipur.
3. Name & Designation of the Programme Leader with address: Dr. Md. Abdur Rashid, PSO, Agricultural Economics Division, BARI, Gazipur.
4. Implementation Locations: The study will be conducted in eight districts namely, Jessore, Narshingdi, Rangpur, Comilla, Faridpur, Nilphamari, Rajshahi and Natore in this year.
5. Major Activities: Site selection and questionnaire preparation Data collection Review of literature and compilation of report have been done.
6. Budgetary Information: i) Total Approved Budget: Tk. 9, 00,000/- ii) Fund released (17/04/13):Tk. 2, 25,000/- ii) Fund spent (17/04/13):Tk. 2, 00,000/-
7. Constraints & Suggestions: Insufficient fund and Delay fund release.

Monitoring Report of Team-3

A three member monitoring team was formed to observe the progress of the Core Sub-Projects conducted by different research institute and university like SAU and SRDI Chittagong. The team leader and members were Dr. Meraz Uddin Ahmed, MD (A&F), BARC, (Team Leader); Dr. Abdus Salam, PSO (P&E) (Member); Mr. Md. Mustafizur Rahman, STO, BARC (Member). The team monitored the progress of activities of the following projects on 1-2 February 2013.

i) Adaptation of heat tolerant tomato and photo insensitive country bean variety during summer season in Sylhet region;
ii) Development of artificial breeding techniques of *Sperata aor; and*
iii) Effect of different hedge spices on soil *erosion and crop yield at different hill slopes* in Chittagong Hill Tracts Region.

Adaptation of heat tolerant tomato and photo insensitive country bean variety during summer season in Sylhet region

1. Objectives: i) To introduce summer tomato and summer country bean variety in the Sylhet region of Bangladesh; ii) To adapt the suitable variety and production technologies of summer tomato and summer country bean.
2. Implementing Agency: Department of Horticulture, Sylhet Agricultural University, Sylhet.
3. Principal Investigator: Dr. Md. Shahidul Islam, Associate Prof. Department of Horticulture, SAU, Sylhet.
4. Implementation Locations: SAU, Sylhet campus and different Upzillas of Sylhet and Moulavibazar districts.
5. Major Activities:

Sowing of seeds of parental lines of tomato: Sown on October 10 2012 of five parental lines of tomato; Transplanting of seedlings of two tomato parental lines: Transplanted on the main field in Nov Nov 10, 2012; Breeder seed production of BARI Hybrid tomato-4: Parental seed sown on October 12, 2012 and transplanted on Nov 11 2012; Sowing of seeds of country bean variety for breeder seed production: Seeds were sown on September 05, 2012 for breeder seed production; Procurement of research material: Bamboo, cowdung, nylon net, sign board till 31 December 2012; Harvesting of Breeder seed of country bean: Mature seed collection is going on.

6. Budgetary Information: i) Total Approved Budget Tk 480,000 ii) Fund released (to date) Tk. 240,000 (Jan 31) iii) Fund spent (to date) Tk: 103,437.
7. Constraints and Suggestions: The university has no farm division. Labourers are, therefore, hired from outside.
8. Remarks by the Monitoring Team: Overall project performance was good; Last summer season production of tomato was 35-45 ton/ha and country bean was around 8 ton/ha.

Development of artificial breeding techniques of *Sperata aor*

1. Objectives: i) To understand the breeding biology of *S.* aor ii) To assess their reproductive potential in captive condition iii) To develop artificial breeding techniques.

2. Implementing Agency: Dept. of Fisheries Biology and Genetics, Faculty of Fisheries, SAU, Sylhet.

3. Principal Investigator: Dr. Mohammed Mahbub Iqbal Asst. Prof., Department of Fisheries Biology and Genetics Faculty of Fisheries, SAU, Sylhet.

4. Implementation Locations: SAU campus, Tilagor, Sylhet American Fish Farm Ltd, Zakigonj, Sylhet.

5. Major Activities:

Sl. No.	Planed activities	Implementation Status
01	Gonadal development	Gonald development testing is on
02	Reproductive biology	Reproductive biology of *S. aor* in captive condition has been investigating manually from May to December. Their gonads were either empty or spant from June to September since they have been collected from the nature. Gonads became very thin and transparent with the progress of winter.
03	Preparation of brood fish	Domestication and culturing of *S. aor* has been in progressing both in on station and on farm. Average weight of brood fish reared in on station and on farm is 750 g and 1300 g, respectively.
04	Maturity enhancement	Since the breeding season of *S. aor* seems to be on May and October, various maturity enhancers such as pituitary extract (PG), human chorionic gonadotropin (HCG) and ovaprim will be injected during that time at minimum doses to promote their gonadal development and ovulation effectively.
05	Mini hatchery development	Since Sylhet Agricultural University is a new university, it has yet been established it's own fish hatchery. So, a mini hatchery for the artificial breeding of *S. aor* has been renovating and developing.

6. Budgetary Information: i) Total Approved Budget Tk. 4,064 ii) Fund released (to date) Tk:2,03,200 iii) Fund spent (to date) Tk:1,50,000

7. Constraints & Suggestions:

Sl No	Constraints	Suggestions by Principal Investigator
01	*S. aor* is getting an endangered species day by day.	They should be collected from the river systems in Sylhet. But it needs to stay with the fisherman in the river for several hours.
02	Intensive mortality of natural fries	Research need to overcome this.
03	Pond size for rearing	They need very big pond with sufficient depth of water for their proper and natural growth.

8. Remarks: (i)Project performance is good;(ii) If it is possible to develop artificial breeding of *Sperata aor* (Air Fish) it will obviously result in good production of the said fish spices in confined water body.

Brood reared at University pond collected from nature

Effect of Different Hedge Species on Soil Erosion and Crop Yield at Different Hill Slopes of Chittagong Hill Tract.

1. Objectives: i) To identify different hedge species and assess alley width in controlling soil erosion ii) To estimate soil loss under different hedge species and alley width at different slopes iii) To examine the effect of different hedge species and their alley width on crop yield at different slopes.

2. Implementing Agency: Soil Conservation and Watershed Management Centre, (SCWMC) SRDI, Bandarban.

3. Principal Investigator : Mr. Md. Mahabubul Islam, Scientific Officer & Officer In Charge, Soil Conservation and Watershed Management Centre, Soil Resource Development Institute.

4. Implementation locations: SCWMC Research farm SRDI, Bandarban

5. Major Activities:

Sl. No.	Planned activities	Implementation Status
01	Site selection, Cleaning and preparation of the areas.	Site has been selected and area has been prepared completely.
02	Marking contour lines.	Contour line has been marked completely in 3 different hill slopes.
03	Sowing/planting	Four different hedge species

	hedge species.	has been sown/ planted along the contour lines.
04	Irrigation	For irrigation on the hedge species pump has been installed and irrigated regularly. Other intercultural activities have been carried on timely.
05	Data on yield and yield attributing characters of Yard long bean &Okra	Yield and yield attributing characters like- Fruit per plant has been taken and others data like- no. of pod/plant, fruit length, no. of seed/pod, fruit wt. fruit length, fruit dia and fresh yield has been recorded and these data has been analyzed .
06	Kharif- crops	Field has been prepared for the cultivation of Kharif-crops, like; yard long bean and okra and seeds has been dibbled. Spikes were inserted for determination of soil erosion
07	Data on yield and yield attributing characters of Yard long bean &Okra	Yield and yield attributing characters like- Fruit per plant has been taken and others data like- no. of pod/plant, fruit length, no. of seed/pod, fruit wt. fruit length, fruit dia and fresh yield has been recorded and these data has been analyzed .

6. Budgetary Information: i) Total Approved Budget:Tk. 4,00000.00 ii) Fund released (to date) Tk.3,00,000.00 iii) Fund spent: Tk. 3,00,000.00.

7. Constraints & Suggestions:

Sl. No.	Constraints	Suggestions
01	Natural weeds grow more rapidly and local labour rate is high.	Suggested to operate close intercultural operation.
02	Attack of insects is relatively dangerous than normal.	At least 50`-00`` around the research area should be cleaned and frequent use of IPM.
03	Difficult of operate research activities for want of fund in time.	Available fund/Budget should be confirmed in time as per necessity of work.

Monitoring Report of Team-4

Eight projects monitored implementation status of the Core Sub-Projects conducted by different research institute and university like BARI, BINA and BAU. The team leader and members were Dr. Kabir Ikramul Haque, MD (Fisheries), BARC; (Team Leader); Mr. Md. Aminuzzaman, Director (M&T), BARC (Member); Dr. Shah Md. Ziqrul Haq Chowdhury CSO, Livestock Division, BARC (Member). Following Projects were monitored by the team members.

- BARI: RARS, Jamalpur:Evaluation of short duration high yielding rapeseed- mustard varieties/lines for cultivation between T.Aman and Boro rice.
- BINA:Development of short duration high yielding and high yielding boro rice varieties through induced mutation.
- BAU: Development of short duration high yielding rice varieties; An Integrated Approach for the Management of Wilts and Foot Rot /Collar Rot of Important Vegetables; Production of Somaclone *In vitro* for Drought Stress Tolerant Plantlet Selection in Potato; Biological Nitrification Inhibition is a novel approach for enhancing nitrogen use efficiency in cereal; Remote Controlled Guti Urea Applicator; Epidemiological Investigation of Anthrax and Determination of Efficacy of Local Anthrax Vaccine in Bangladesh.

Evaluation of short duration high yielding rapeseed-mustard varieties/lines for cultivation between T.Aman and Boro rice

1. Objective (s): i) To evaluate and selection of rapeseed-mustard lines suitable for growing between T. Aman and Boro rice ii) To replace local Tori-7 variety by high yielding short duration variety(s) and to provide an opportunity to the farmers to select appropriate varieties/lines adapted to their local condition iii) To increase production and area of rapeseed-mustard.

2. Implementing Agency: RARS, BARI, Jamalpur, Principal Investigator: Dr. Md. Manjurul Kadir, PSO, RARS, BARI, Jamalpur, Implementation locations: Jamalpur and Sherepur Districts.

3. Major Activities:

Sl. No.	Planed activities	Implementation Status
01	On station screening of rapeseed-mustard varieties/lines (1st Cycle)	-20 lines of each of *B. campestris* and *B. napus* were screened. -For each, 8 lines were selected.
02	Cultivation of short duration T aman rice in 10 farmer's field (July-Oct. 12)	BINADhan-7 was used in Jamalpur and Sherpur-Av. 115-120days, av. yield-10mond/Bigha
03	Evaluation of Rapeseed lines/varieties in farmer's field (Nov. 2012-Jan. 2013)	-8 lines of *B. campestris* + *8 lines of B. napus* -Evaluated in the same Farmers field. -Nap-0733-1, Nap-0865, Nap-205 and Nap-0660, BC-0828-1, BC-08-10 and BC-08-4 performed better (5-6 mond/Bigha). -Check variety: Tori-7
04	Cultivation of Boro rice at the farmers field (Feb.-May, 2013)	-BRRIDhan-28 was used that has been harvested. -Yield of BRRIDhan-28 is around 15.0-18.0 mond/Bigha.

4. Budgetary Information: i) Total Approved Budget: Tk.7,00,00.00 ii) Fund released (to date):

Tk. 3, 58,750.00 iii) Fund spent (to date): Tk. 3,04,216.00.

5. Constraints & Suggestions: i) White mould and *Alternaria* blight were two severe diseases of rapeseed mustard. ii) Rovral was used to control, price of which increases every year, which the Farmers can not afford. iii) Authority should take initiatives so that availability of the fungicide should be ensured.

Development of short duration high yielding and high yielding boro rice varieties through induced mutation

1. Objective (s): i) To develop boro rice variety(s) with yield potential of 8.0-8.5 t/ha and 155-160 days maturity ii) To develop short duration (115-120 days) boro rice variety(s) with 6.0-6.5 t/ha yield that can be transplanted after harvest of high yielding mustard/rapeseeds variety
2. Implementing Agency: Plant Breeding Division, BINA.
3. Principal Investigator: Dr. Md. Abul Kalam Azad, PSO, Plant Breeding Division, BINA.
4. Implementation Locations: BINA Farm (Mymensingh); BINA sub-station farms at Magura, Isurdi, Rangpur & Barisal; BINA Annex farm at Jamalpur and Farmers's field at Mymensingh, Jamalpur, Isurdi, Rangpur, Magura and Barisal.

5. Major Activities:

Sl.No.	Planned activities	Implementation Status
On-farm and on-station trial with 2 short duration Boro Mutant Lines		
01	Selection and preparation of land and raising seedlings of 2 mutants- RM-(1)-200(C)-1-10 and RM-(1)-200(C)-1-17 compared with BRRIdhan28	Done during 09 to 29 January 2013
02	Transplanting of seedlings and intercultural operations at 10 locations (5 on-stations & 5 at farmers' fields)	Transplanted during 22 February to 08 march 2013
03	Harvesting	3rd week of May 2013 and data were collected for statistical analysis
04	Training/field days	The comparative field performance of these two mutant lines has been evaluated by NSB team.
Advance yield trial with M_7 high yielding mutant lines of boro rice		
01	Selection and preparation of land and raising seedlings of HYV boro rice of six mutants compared with BRRIdhan29 at 4 locations (Mymensingh, Magura, Rangpur and Barisal)	Done during 8-26 January 2013
02	Transplanting of seedlings and intercultural operations	Transplanted during 24 January to 26 February 2013
03	Harvesting	Harvested in 1st week of June 2013 at Mymensingh and Barisal, and harvesting stage at other locations

6. Budgetary Information: (i) Total Approved Budget: Tk: 4,00,000.00, (ii) Fund released (to date): Tk: 3,00,000.00, (iii) Fund spent (to date):

Development of Short Duration High Yielding Rice Varieties

1. Objective (s): To select and develop short duration high yielding rice varieties for the Boro, Aus and T. Aman seasons to fit into the existing cropping pattern.
2. Implementing Agency: Dept. of Genetics and Plant Breeding, BAU, Principal Investigator: Professor Dr. Lutful Hassan, Dept. of Genetics and Plant Breeding, BAU, Implementation Locations: Mymensingh Sadar, Haluaghat, Muktaghacha and On-station.

5. Major Activities and Achievements:

1. Growing of F1 population and collection of F2 seeds (Boro season) for short duration and higher yield.
2. Growing of F1 seeds and collection of F2 seeds(Aus season) for short duration and higher yield.
3. Growing of F2 seeds and Selection of desired F3 genotypes (Aman season).
4. Selection of advanced breeding lines for short duration high yielding rice developed before by the Dept. of Genetics & Plant Breeding, BAU
5. On farm variety trial will be conducted with short duration advanced lines to look into the stable yield. Every step completed satisfactorily.

6. Budgetary Information: i) Total Approved Budget: Tk. 9,50,000/- ii) Fund released (to date): Tk: 5,50,589/- iii)Fund spent (to date): Tk:5,44,431/-
7. Constraints & Suggestions: i) Budget for the last quarter of 2012-13 needs to be released soon.
ii) Authority should take care of it.
8. Any other Information: This is a good project that should be continued.

An Integrated Approach for the Management of Wilts and Foot Rot/Collar Rot of Important Vegetables

1. Objective (s): i)To study the efficacy of *Trichoderma harzianum* as biocontrol agent against *Fusrium oxysporum (fungus), Scleortium rolfsii (fungus), Ralstonia solanacearum (bacteria), Meloidogyne javanica (nematode)* and causing wilts

and foot rot of vegetables. ii) To formulate *Trichoderma* as bio-control agent for controlling wilts and foot /collar rot of vegetables(iii)To develop cost-effective, commercially viable mass production technology of *Trichoderma.*

2. Implementing Agency: IPM lab, Dept. of Plant Pathology, BAU, Principal Investigator: Professor Dr. Mohammad Delwar Hossain (In-charge), IPM lab, Dept. of Plant Pathology, BAU, Implementation Locations (Trial site): IPM Lab, Plant Disease Clinic, Net House, Field lab. of Dept. of Plant Pathology, BAU, Farms of vegetable growers of Mymensingh and Bogra.

5. Major Activities and Achievements:

1. Collection and Characaterization of Trichoderma spp and their bio-assay against wilt pathogens of vegetables.
2. Determination of the efficacy of different substrates in the formulation of *Trichoderma harzianum*.
3. Net house assay (in Tray) of *Trichoderma* formulation against wilts and collar rot pathogens.
4. Field evaluation of formulated *Trichoderma* against wilts and collar rot diseases of Tomato, chili and Indian spinach at BAU farm. Every step completed satisfactorily.

6. Budgetary Information: (i)Total Approved Budget: Tk:9,00,000.00, (ii) Fund released: Tk:5,95,000.00, (iii)Fund spent: Tk: 5,84,632.00.

7. Constraints & Suggestions: i) Budget is not sufficient for training and demonstration of technology: P.I. should apply to the authority with proper justification ii) Trichoderma could not grow at temperature down to 5^0C: Formulated Trichoderma should not be used in cool weather iii) Prices of chemicals are getting higher and higher that hits the budget.

8. Any other Information: This is a good project and the progress is satisfactory.

Production of Somaclone In vitro for Drought Stress Tolerant Plantlet Selection in Potato

1. Objective (s): i)To establish a protocol on callus induction, proliferation and high frequency plantlet regeneration through somatic embryogenesis ii)To development a system for selection of somaclones *in vitro* under drought stress iii) Isolation and development of drought tolerant strain for farmers use iv) Capacity building and manpower development on *in vitro* somaclone production in potato v) Creation of knowledge on morpho-physiological features and production potential of *in vitro* grown plantlets of potato.

2. Implementing Agency: Dept. of Crop Botany, BAU, Principal Investigator: Prof. Dr. M. Obaidul Islam, Dept. of Crop Botany, BAU, Implementation Locations: T.C. Lab. and Field lab., Dept. of Crop Botany, BAU.

1. Major Activities:

Drought Stress Tolerant Somaclones Production: Node derived callus culture in PEG supplemented medium; Selection of stress tolerant plantlets (done).

Hardening and cultivation of plantlets: Plantlet hardening in room (The rooted part or the part that inside the media washed with tap water. Whole plantlets were kept over toilet paper and sprayed with also tap water); Transplantation of screened plantlets in field; Agronomic care and management of plantlets; Harvesting of potato from selected plants in the field (done).

Storing mini tuber (20-24 mm) & breeder tuber in Lab (on-going).

4. Budgetary Information: i) Total Approved Budget: Tk.9,00,000/- ii) Fund released (to date): Tk. 5,24,250/- iii) Fund spent (to date): Tk.5,24,250/-

7. Constraints & Suggestions:

i) Load shedding due to no-electricity: Principal Investigator. should discuss the matter with BAU and electricity authority. ii) Impurities of supplied chemicals: P.I. should internally manage. iii) Lack of storing facilities of mini/breeder tubers: P.I. should discuss with his authority.

5. Any other Information: This is a good project and the progress is satisfactory. P.I. said, for the field study, it is needed a bigger fund and facilities for safe and successful production and selection of tolerant lines in future.

Biological Nitrification Inhibition is a novel approach for enhancing nitrogen use efficiency in cereal

1. Objective(s): To i) collect and evaluate the sorghum germplasms from different regions for BNI function; ii) check the stability and ability of BNI from sorghum in the soil; iii) evaluate of the nitrification inhibitory compound/s from sorghum on rice growth environment; iv) Physiological studies on the mechanisms effecting BNI-compounds release; mode of action of BNI release from roots.

v) Introduce the targeted trait of sorghum to the rice plant for genetic improvement of next generation cultivars through biotechnological approach.

2. Implementing Agency: Dept. of Crop Botany, BAU, Principal Investigator: Prof. Dr. A.K.M. Zakir Hossain, Dept. of Crop Botany, BAU,

Implementation Locations: Plant Physiology Lab.,

Crop Botany Field Lab., Prof. Muhammed Hossain Central Lab., BINA Lab.

3. Major Activities:

Sl. No.	Planned activities	Implementation Status
01	Evaluate the ability and stability of the identified nitrification inhibitory compound from sorghum in the soil	the identified compound has the ability to stay in the soil for longer period of time (Stability 53% and stability 40-50% even after 60 days)
02	Collection and evaluation of sorghum germplasms for high BNI production	Among the tested sorghum varieties, none of the varieties from home and abroad showed detectable BNI capacity except hybrid sorgho from Japan
03	To evaluate of the nitrification inhibitory compound/s from sorghum on rice growth environment	BNI has the significant contribution in increasing nitrogen use efficiency (20-25%) in rice production
04	Physiological studies on the mechanisms effecting BNI-compounds release; mode of action of BNI release from roots	The results showed that NH4 has the trigger effects for BNI release from roots.
05	Identified and introduce the targeted trait of sorghum to the rice plant for genetic improvement of next generation cultivars through biotechnological approach	Based on the results of more physiological studies, necessary experimental design will be undertaken

4. Budgetary Information: i) Total Approved Budget:Tk. 11,40,000/- ii) Fund released (to date): Tk. 6,00,000/- iii) Fund spent (to date):Tk. 5,80,000/-.

5. Constraints & Suggestions: i) Fund release was little bit delayed for second installment of the current year:Authority should take care of it.

6. Any other Information: This is a good project which ultimately may contribute to reduce nitrogen fertilizer in cereal production system.

Remote Controlled Guti Urea Applicator

1. Objective (s): (i) Development of a remote controlled guti urea applicator, characterized by increased operational comfort, low cost and precise placement.

2. Implementing Agency: Dept. of Farm Power and Machinery, BAU, Principal Investigator: Prof. Dr. A.T.M. Ziauddin, Dept. of Farm Power and Machinery, BAU, Implementation Locations: Dept. of Farm Power and Machinery, BAU.

3. Major Activities and Achievements: Study on available design & prototypes; remote control mechanism, 100% completed; Prepare design of the proposed device, 100% completed; Estimate the required power of the battery, the Dc motor & the remote control unit, 95% completed; Purchase construction materials and equipment, 95% completed; Manufacture of first version of the device, 100% completed; Conduct Lab. and field trial with the first version, 100 % completed; Further physical improvement of the device and second version developed, 80% completed; Preliminary field trial 20% completed. Further modification and field trial 20% completed.

4. Budgetary Information: i) Total Approved Budget: Tk. 12,87,500.00 (3 years) ii) Fund released (to date): Tk. 6,38,000.00 iii) Fund spent (to date): Tk. 4,92,203.00.

5. Constraints & Suggestions: i) Activities were performed with difficulties. Some activities were done with time lag of two months.

6. Any other Information: A local workshop has been scheduled in the third week of June 13. This is a good project targeting to develop a farmer's friendly simple device of USG applicator and the project should be continued.

Epidemiological Investigation of Anthrax and Determination of Efficacy of Local Anthrax Vaccine in Bangladesh

1. Objective (s): i) To determine the environmental factors (soil type, pH, geographical location, environmental temperature, humidity, season etc.) responsible for the outbreak of anthrax. ii)To determine the host factors (age, sex, breed, nutritional status, immune status) associated with the outbreak of anthrax. iii)To determine the role of managerial (feeding, bedding, watering, prevention and control measures etc.) and vector system in transmitting the disease. iv) To isolate and characterize *B. anthracis* from the suspected sources. v) To determine the efficacy of local anthrax vaccine produced by LRI, Mohakhali, Dhaka.

2. Implementing Agency: Dept. of Microbiology and Hygiene, BAU, Principal Investigator: Assist. Prof. Jayedul Hassan, Dept. of Microbiolog and Hygiene, BAU, Implementation Locations: Five thanas of Tangail, Sirajgong, Pabna, Kushtia and Bogra.

5. Major Activities and Achievements: Field survey and selection of target area, 100% completed; Epidemiological investigation of the factors associated with anthrax outbreak in Bangladesh, 95% completed; Isolation and characterize *B. anthracis* from the suspected sources, 95% completed; Determination of immune status of target general animal population before and after vaccination, 95% completed.

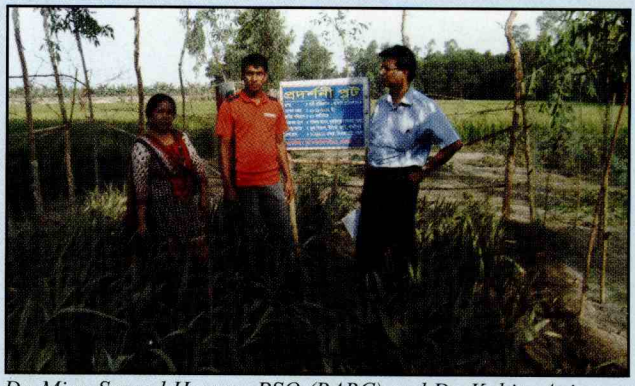
6. Budgetary Information: i)Total Approved Budget: Tk.12,00,000.00 (3 years) ii) Fund released: Tk. 7,22,500.00 iii) Fund spent: Tk. 6,94,648.00.
7. Constraints & Suggestions: i) Fund release: Authority should consider to release fund in one/two slot instead of 4 different slots in a year. ii) Microbiological laboratory settings: At least a room of the Microbiology Depertment. may be established as BSL-3.
8. Any other Information: This is a good project of working with an important remarkable disease, Anthrax. The project should be continued.

Monitoring Report of Team-8

The team comprised of Dr. Paresh Chandra Golder, Member-Director (Planning & Evaluation), Dr. Mian Sayeed Hassan, PSO (Crops) and Mr. Ajit Kuamr Chakrabarty, Deputy Director (Fanance) visited the demonstration trials of gladiolus at Sonatola sadar Upazila, Bogra on 15 April 2013. Dr. Kabita Anjuman Ara, PSO (HRC), BARI and Principal Investigator of the project was along with the team. The field performances of the demonstrations were satisfactory. Farmers showed their keen interest to cultivate the gladiolus because it is more profitable than other crops. They proposed to supply sufficient seeds for large demonstration in the next year.
Institutes Involved in Monitoring: i) Bangladesh Agricultural Research Institute (BARI) ii) Bangladesh Institute of Nuclear Agriculture (BINA) iii) Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur.

Improvement of gladiolus quality and its adaptation. *Trial 1: Adaptive trial of different varieties of gladiolus at farmers' field*

1. Objectives: i) To show production technology of gladiolus among target group of farmers. ii)To ensure feasibility and suitability of the land.
2. Principal Investigator: Dr. Kabita Anzu-Man-Ara, Principal Scientific Officer.
Floriculture Division, HRC, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur-1701.
3. Methodology & Locations: Demonstration trials were setup with BARI gladiolus-1 and BARI gladiolus-3 varieties in 3 locations during 20-30th Nov, 2012 having 50 m^2 area for each farmer. Five farmers were considered in each location. The locations are: Gadkhali (Jessore), Burirhat (Rangpur) and Sonatola (Bogra) –Visited.
4. Training: Thirty farmers were trained to improve their knowledge on gladiolus cultivation at Sonatola, Bogra.



Dr. Mian Sayeed Hassan, PSO (BARC) and Dr. Kabita Anjuman Aar, PSO (BARI) visiting the gladiolus demonstration plot at farmers' field

5. Budgetary Information: i)Total Approved Budget; Tk. 3,19,000.00 ii) Fund released (to date):Tk 2,39,250.00 iii) Fund spent (to date):Tk. 2,06,972.00
6. Observations & Comments: i) Team visited the demonstration sites of the farmers Mr. Sakilut Zaman & Nur Mahammad of the Sonatola Sadar and Sujitpur village, ii) The field performance of the demonstrations were satisfactory, iii) Demonstration areas were very small (50 sqm) and sites were not properly selected, iv) Farmers showed their keen interest on the cultivation of gladiolus, v) Team suggested to select demo sites in the represented points (road side), not in homestead area, vi) More demos in proper place should be organized for the expansion of gladiolus cultivation in the region.

Isolation, Identification and characterization of the etiological agent of infectious coryza in chicken and development of its effective remedial measures

1. Implementing Organization: Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh, Principal Investigator: Prof Dr. Md. Mostafizer Rahman, Project Director, Hajee Mohammad Danesh Science and Technology University, Dinajpur.
2. Objectives: To i) isolate & identify the etiological agent of Infectious Coryza from suspected and infected field cases based on age, sex, breed, spatial and temporal differences, ii) characterize the isolated etiological agent of Infectious Coryza by using cultural, biochemical, serological, antibiogram study and molecular techniques, iii) develop and validate vaccine candidate from the field isolate to control Infectious Coryza in chicken.
3. Technical progress: Collection of Infectious Coryza sample from suspected and infected field cases based on age, sex, breed, spatial and temporal differences, collected 42 samples, 84% progress; Isolation & identification of the etiological agent of infectious coryza from field cases, 50% progress; Develop and validate vaccine candidate from the field isolate. Collection of Infectious Coryza sample from suspected and infected field cases based on age,

sex, breed, spatial and temporal differences, collected 42 samples, 84% progress.
4. Budgetary Information: i) Total Approved Budget; Tk. 3,00,000.00 ii) Fund released (to date):Tk 1,50,000.00 iii) Fund spent (to date): Tk. 1,45,000.00
5. Observations of the team: i) The study was running as per plan, ii) Molecular characterization of the pathogens will be started very soon, iii) Late receipt of fund.

The team visited the project named "Isolation, identification and characterization of the etiological agent of infectious coryza in chicken and development of its effective remedial measures" implemented by Dr. Md. Mostafizer Rahman, Professor, Hajee Mohammad Dahesh Science and Technology University, Dinajpur. The study was running as per plan. Molecular characterization of pathogens not yet started.

The team also visited the trial "Development of High yielding short duration boro rice varieties through induced mutation" implemented by Dr. Md. A.K. Azad, PSO Bangladesh Institute of Nuclear Agriculture (BINA) at on-station and farmers' field at Rangpur on 17 April 2013. The plants were at minimum tillering stage and management was quite satisfactory. The farmers opined that some mutant lines can be harvested 10-12 days earlier that BRRIdhan29, those can be transplanted after harvest of high yielding mustard/rapeseed.

Dr. Paresh Chandra Golder, Member Director (BARC), Dr. Mian Sayeed Hassan (BARC) and Dr. Abul Kalam Azad (BINA) visiting the Mutant Boro rice demonstration plot

Monitoring report on SPGR-NATP Projects

Monitoring Team-3 comprising 1) Dr. Abul Kalam Azad, CSO (Crops), BARC; 2) Mr. Aminuzzaman, Director (Train. & Manpower) and 3) Dr. Mian Sayeed Hassan, PSO (Crops) where Dr. Abul Kalam Azad lead the team. Team-1 visited during 17- 19 February 2013 in Mymensingh at a) Bangladesh Institute of Nuclear Agriculture (BINA) b) Bangladesh Fishery Research Institute (BFRI) and c) Bangladesh Agriculture University (BAU). A total 35 projects were assigned for monitoring and 15 projects were visited which are reported below:

Livelihood improvement of farming community in haor area through system approach

Principal Investigator: Dr. Sultan Uddin Bhuiyan, Prof, Dept. of Agronomy, BAU.
Components of the project: i) Crop and Agro-forestry, ii) Socio-economic, iii) Rural Hydrology & Mechanization, iv) Fisheries, v) Livestock.
Observations of the team: Presently, field has no standing crops or other components; The activities have been conducted as per design so far; 1450 farmers, trainers and development workers have trained; Internal monitoring was done systematically.

Coordinated Project on Soil Fertility & Fertilizer Management for Crops and Cropping Patterns: BAU Component

Principal Investigator: Dr. M. Jahiruddin, Prof. Dept of Soil Sci, BAU.
Observations of the team: Requirements of micronutrients (Zn and B) in rice, wheat, potato, maize, cabbage, carrot, tomato, cauliflower, mustard, onion and sugarcane have been evaluated; Team visited BAU farm-2 (Potato, rice & onion); Response of Zn & B in potato is quite encouraging; Field management and involvement of PI is good.

View of Team visiting BAU farm-2 (Potato, rice & onion)

Coordinated Sub-Project on Characterization of Important Plant Genetic Resources: BAU component

Principal Investigator: Dr. M A Rahim, Prof, Dept. of Horticulture, BAU.
Observations of the team: Morphological characterization of 2 GI crops & some BAU released varieties has been completed; DNA extraction of some GI crops & BAU released varieties has been done.

Support Smallholder Dairying in Bangladesh

Principal Investigator: Professor Dr. A.K. Fazlul Haque Bhuiyan Prof, Dept. of Animal Breeding & Genetics, BAU.

Observations of the team: Completed the bench mark survey; Supplied good quality semen of dairy genetic merits of superior genotypes; Identified & registered 158 elite cows; Identified 62 calf.

Approaches to develop broiler sire and dam line from available genetic resources

Principal Investigator: Dr. Md. Ashraf Ali Prof. Dept of Poultry Science, BAU.

Observations of the team: Collected meat type parents to produce day old boiler chicken; Selection & evaluation is going on for male & female parent line; The activities seem to be a good work and should support for getting a stable result.

Improved Potato Storage Facility for Farm Household

Principal Investigator: PI: Prof. Dr. A.T. M. Ziauddin, BAU.

Observations of the team: Prepared a design and drawing of the storage; A semi- concrete structure is being constructed for storing potato in farm households; Under this project only design is being developing but based on the objective it should be tested in the farm households.

Gene banking of improved broodstocks of Indian Major Carps (catla, rohu & mrigal) & development of breeding technique of three threatened species (*mohashol, bagair & baim*)

Principal Investigator: Prof. Dr. Md. Fazlul Awal Mollah, Dept. of Fish Biology and Genetics, BAU.

Observations of the team: Selective breeding of rohu & mrigal was conducted; Domestication of mohashol, bagair & baim are going on; Crio preservarion of sperm of rohu & mrigal have done (reported); It is a useful research work and should be continued.

Development of salt tolerant rice varieties through induced mutation and marker-assisted selection

Principal Investigator: Dr. Mirza Mofazzal Islam, PSO, Plant Breeding Div., BINA.

Observations of the team: PBRC37 has already been released as BINA dhan10 for saline ecosystem; 300 BC1F1 population was being characterized using SSR marker and screened for developing salt tolerant rice variety.

Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns: BINA component

Principal Investigator: Dr. Md. Mohsin Ali, PSO, Soil Sci, Div., BINA.

Observations of the team: PBRC37 has already been released as BINA dhan10 for saline ecosystem; 300 BC1F1 population was being characterized using SSR marker and screened for developing salt tolerant rice variety.

Coordinated project on water management for enhancing crop production under changing climate

Principal Investigator: Dr. Md. Asgar Ali Sarkar, CSO & Head, Ag. Eng, BINA.

Observations of the team: Collected long-term agro-meteorological data for assessing and predicting climatic changes; Irrigation schedules of rice and non-rice crops have evaluated; Long-term water table fluctuation and ground water utilization have evaluated; Organized field days & training for working scientists, staffs and farmers.

Development and up scaling of integrated pest management technologies in vegetable crops: A Coordinated Project

Principal Investigator: BINA: Dr. Md. Jahangir Alam PSO, Ent, BINA.

Observations of the team: IPM package on brinjal shoot and fruit borer were evaluated at Gaforgaon, Mymensingh, Nakla, Sherpur; IM of cucurbit fruit fly and fruit borer in bottle gourd & cucumber were evaluated.

Sub-Project on Characterization of Important Plant Genetic Resources: BINA component

Principal Investigator: Dr. Shamsun Nahar Begum, SSO, Pl Br., BINA.

Observations of the team: As per report 50 rice, 8 mustard, 32 mungbean, 6 chikpea, 28 lentil and 9 tomato varieties were morphologically characterized & documented; GI crops of blackgram mungbeas and sesame were also characterized morphologically; Lentil were characterized using molecular marker.

Coordinated sub-project on Farming System Research and Development for Farmers' Livelihoods Improvement: BFRI (Fisheries) Component

Principal Investigator: Dr. A. H. M. Kohinoor, SSO, BFRI.

Observations of the team: After 4 months rearing, the wt. of Shing, Monosex Tilapia and Silver barb are 25-40, 70-85 & 50-70g, respectively; Production of monosex tilapia were 4250-4680 kg/acre in four months rearing; 90 ducks are being reared among six female, monthly average egg production is 216 and getting average income Tk. 1600; 434 four animals

were de-wormed & vaccinated (Cattle: 82; Goat: 50; Duck: 150 and Chicken: 152.

Workshop on M&E activities of the NARS

A day long workshop on "Monitoring and Evaluation (M&E) activities of the NARS institutes" organized jointly by Planning and Evaluation Division, BARC and Project Implementation Unit (PIU)-BARC of the NATP phase-1 was held on 27 Nov 2012. The objective of the workshop was to know the M & E findings of each ARI. Each ARI has an M & E cell comprised of 5-7 members. The cell is assigned to monitor and evaluate the activities of the SPGR sub-projects under NATP and institutional core programme as well. The inaugural session was presided over by Dr. Paresh Chandra Golder, Member-Director (Planning & Evaluation), BARC. Dr. Wais Kabir, Executive Chairman, BARC was present as chief guest. In the technical sessions, each ARI has presented their M & E activities in the workshop. A total of 90 participants attended the workshop. Participants of workshop agreed that monitoring and evaluation are the important tools in achieving the programme/project success. The participants of ARIs mentioned the inadequate manpower for M&E activities. The Executive Chairman, BARC in his concluding remarks opined that each ARI should have M&E unit with adequate manpower.

Dr. Wais Kabir, Executive Chairman, BARC is presiding over the workshop on M&E activities in the NARS institutes

Field Monitoring Workshop on SPGR Sub-Projects

A day long "Field Monitoring Workshop of the SPGR Sub-Project" organized jointly by Planning and Evaluation Division, BARC and Project Implementation Unit (PIU)-BARC: NATP Phase-1 was held on 20 May 2013. The idea of the workshop was to share the field monitoring findings, cheek whether anything going otherwise and take corrective measures with a view to improve the performance of the grants made. Dr. Paresh Chandra Golder, Member-Director (Planning & Evaluation), BARC presided over the inaugural session and Dr. Wais Kabir, Executive Chairman, BARC was present as chief guest. The chief guest requested the coordinators and principal investigators to take all out care in the implementation of the SPGR Sub-projects. He also suggested to expedite the expenditure of research activities and related procurement. Farther he stressed on the publications of research findings and documentation publicity of success in print and electronic media. A total of 100 participants comprising the sub-project coordinators, principal investigators, BARC scientists, experts from the Project Coordination Unit (PCU), Krishi Gobesona Foundation (KGF), PIU-BARC attended the workshop. Coordinators, principal investigators and the others present had lively discussion and interacted on the monitoring findings. Suggested appropriate actions were adopted as the workshop recommendations and to be followed by all concerned.

Comments/suggestions/decisions made in the workshop on different sub-projects:

Team No	Name of the Sub-project, Coordinator and PIs	Comments/ Suggestions by the participants	Decision/Action to be taken
1.	(1) Development and adaptation of solar pump irrigation system under eco-friendly environment Dr. Md. Ayub Hossain, Principal Scientific Officer, FMPE Division, BARI, Joydebpur Gazipur-1701	(i) Slow procurement (ii) Dissemination of generated technology to be expedited	(i)Procurement to be expedited (ii) Dissemination technology to be expedited
	(2) Studies on the Impact of Climate Change on fungal diseases of Crops, Dr. Md. Sakhawat Hossain, CSO, ORC, BARI, Gazipur	(i) Emphasis on knowledge management	(i) Booklet, leaflet etc. to be developed based on the findings.
	(3) Development of Integrated Disease Management Technologies for Soil Borne Pathogens, Dr. Tapan Kumar Dey, CSO & Head, PPD, BARI	(i) Internal monitoring lacking	(i) Internal monitoring to be strengthened
	(4) Selection of elite lines and improved production technologies for oilseed crops Dr. Md. Rawshan Ali, CSO, ORC, BARI, Gazipur	(i) Emphasis on varietal development	(i) Trial should be conducted for variety development

	(5) Molecular characterization of Tomato Yellow Leaf Curl Virus (TYLCV) in Bangladesh and development of TYLCV resistant tomato using recombinant DNA technology Dr. Md. Abdullah Yousuf Akhond, SSO, Biotechnology, Division, BARI, Gazipur	(i) Project Should be continued	(i) Based on the present findings activities to be continued.
	(6) Development of Short Stature High Yielding Wheat Varieties Tolerant to High Temperature. Mr. Md. Abdul Hakim, SSO, Wheat Research Center, Dinajpur	(i) Experiments may be conducted in control condition	(i) If possible experiments to be conducted in control condition
	(7)Assessment of Aquatic Pollution and Biodiversity of some lakes of Dhaka City Dr. M. Niamul Naser, Professor, Dept. of Zoology, DU	(i) Final report submitted in time	(i) High lighting the objectives final report to be revised.
	(8) Production and development of jute based blended fabrics in cotton processing system for textile uses, Dr. Md. Abul Kalam Azad, Director (cc), Jute & Textile Product Development Center, BJRI, Dhaka	(i) Dissemination of generated technology to be expedited	(i) Measures to be taken to disseminate generated technology to the end users.
	(9) Coordinated Sub-Project on Characterization of Important Plant Genetic Resources: BJRI Component, Dr. M Abbas Ali, Chief Scientific Officer, Genetic Resources and Seed Division, BJRI, Dhaka	(i) Internal monitoring to be strengthened	(i)Internal monitoring to be strengthened
	(10) Carbon Sequestration in Soils of Bangladesh Dr. Md. Mizanur Rahman, BSMRAU, Gazipur	(i) Emphasis on final report preparation.	(i) Based on objective final report to be prepared in time
	(11) Coordinated Sub-project on Improvement of Agro-forestry Practices for Better Livelihood and Environment: BSMRAU Component Dr. Md. Giashuddin Miah, Prof., BSMRAU	(i) Emphasis on final report preparation.	(i) Based on objective final report to be prepared in time
2.	(1) Assessment of Post-harvest Losses and Improvement of Postharvest Practices of Major Fruits and Vegetables of Bangladesh Dr. Md. Sekender Ali, Ser-e-Bangla Agricultural University, Dhaka.	(i) Emphasis on final report preparation.	(i) Based on objective final report to be prepared in time
	(2) Integrated Crop Management for the Improvement of Jackfruit, Dr. M. A. Rahman, Chief Scientific Officer, HRC, BARI, Gazipur	(i) Dissemination of generated technology to be expedited	(i) Measures to be taken to disseminate generated technology to the end users
	(3) Assessment of socio-economic impacts on oilseeds research and development in Bangladesh Dr. M.A. Monayem Miah, BARI, Gazipur.	(i) Emphasis on final report preparation.	(i) Based on objective final report to be prepared in time
	(4) Consequences of Tobacco Cultivation in Bangladesh, Tanvir Mahmud Bin Hossain, BARI, Gazipur	Slow procurement	Procurement to be expedited.
	(5) Coordinated project on contaminants and adulterants in food chain and their mitigation: BARI component, Dr. Md. Miaruddin,PSO Postharvest Technology Division, BARI. Gazipur	Revision the project budget is needed	Revised budget to be submitted very soon
	(6) Development of hybrid summer tomato variety, production packages and on farm validation of the developed technologies, Dr. M Nazim Uddin , BARI, Gazipur.	(i) Dissemination of generated technology to be expedited	(i) Measures to be taken to disseminate generated technology to the end users
	(7) Research and technology generation in lac as a means towards elevation of poverty and income of the small and marginal farmers Debasish Sarker, BARI, Gazipur.	(i) Dissemination of generated technology to be emphasized	(i) Measures to be taken to disseminate generated technology to the end users
	(8) Development and up scaling of integrated pest management technologies in vegetable crops Dr. Syed Nurul Alam, PSO, Entomology Division, BARI, Gazipur.	(i) Final report submitted in time	(i) Highlighting the objectives final report to be prepared.
	(9) Identification of production package for high value horticultural crops through hydroponics culture, A.K.M Salim Reza Mollik, BARI, Gazipur.	(i) Needs to strengthen the projects activities	(i) As per plan, activities to be performed
	(10) Identification of existing races of *Pyricularia grisea* for gene pyramiding for durable blast resistance in rice, Dr. Md. Ansar Ali, Chief Scientific Officer, Plant Pathology Division,BRRI, Gazipur	(i) Needs to strengthen the projects activities	(i) As per plan activities to be performed
	(11) Pyramiding bacterial blight resistant genes into the genetic background of BR11-derived submergence tolerant rice lines Dr. K M Iftekharuddaula ,Principal Scientific Officer, Plant Breeding Division, BRRI, Gazipur.	(i) Needs to strengthen the projects activities	(i) As per plan, activities to be performed
	(12) Pyramiding Salinity and Submergence Tolerance Genes into BRRIdhan49 Through Marker Assisted Selection, Mr. Md. Ruhul Amin Sarker, BRRI, Gazipur	(i) Needs to strengthen the projects activities	(i) As per plan, activities to be performed
	(13) Coordinated Project on Contaminants and Adulterants in Food Chain and their Mitigation: BRRI Component, Dr. Muhammad Ali Siddiquee Principal Scientific Officer & Head, Grain quality and Nutrition Laboratory, BRRI, Gazipur	(i) Emphasis on final report preparation.	(i) Based on objective, final report to be prepared in time
	(14) Development of Hybrid Rice and Production of Parental Lines,A S M Masuduzzaman, PSO, Plant Breeding Division, BRRI, Gazipur.	(i) Emphasis on final report preparation.	(i) Based on objective final report to be prepared in time

	(15) Genetic enhancement of local rice germplasm towards aromatic hybrid rice variety development in Bangladesh, Prof. Dr. M. A. Khaleque Mian, BSMRAU, Gazipur.	Revision of the project for time extension	Project to be revised with no cost extension
	(16) Development of threshold level of *Colletotrichum corchori* in jute seed. Ms. Hasina Banu, Principal Scientific Officer Pest Management Division, BJRI, Dhaka	Financial progress is poor	Financial progress to be expedited
	(17) Generation of short duration high oil content high yielding doubled haploid (DH) varieties of rape seed through microspore embryogenesis Dr. Md. Shahidur Rashid Bhuiyan, SAU, Sher-e-Bangla Nagar, Dhaka	(i) Final report submitted in time	(i) Highlighting the objectives, final report to be prepared.
	(18) Study on milk urea nitrogen (MUN) for improvement of dietary nutrition of dairy cows in Bangladesh, Dr. Md. Sazedul Karim Sarker, SSO, BLRI, Savar, Dhaka	(i) Final report submitted in time	(i) Highlighting the objectives, final report to be prepared.
	(19) Coordinated Project on contaminants and adulterants in food chain and their mitigation: BLRI Component, Dr. Nathu Ram Sarker , Senior Scientific Officer and Head, Animal Production Research Division, BLRI, Savar, Dhaka, Bangladesh	(i) Final report submitted in time	(i) Highlighting the objectives, final report to be prepared.
3.	(1) Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns (SFFMP) : BRRI Component Dr. Pranesh Kumar Saha, PSO, Soil Science Division, BRRI	(i) Final report submitted in time	(i) High lighting the objectives, final report to be prepared.
	(2) Development and Validation of USG Applicator and Transplanter, Mr. Md. Anwar Hossen , SSO, BRRI	Needs to disseminatie the technology	Steps to be taken for dissemination of the technology
	(3) Co-ordinated Sub-project on Farming System Research and Development for Farmers' Livelihood Improvement: BRRI Component Dr. Md Abdul Muttaleb, SSO, RFSD, BRRI Gazipur	Slow expenditure	Expenditare to be expedited
4.	(1) Integrated crop management for the improvement of jackfruit (Madhupur, Tangail); Dr. M.A Rahman, CSO, Plant Pathology Section, BARI	(i) Technology needs to disseminate.	Necessary steps to be taken to disseminate the technology to the farmers
	(2) Sustainable management of available water resources of unfavorable hill ecosystem; Dr. Md. Mohabbat Ullah CSO, Hill Agricultural Research Station, Khagrachari	(i) Technology needs to disseminate.	Necessary steps to be taken to disseminate the technologies to the farmers
	(3) Coordinated Project on Improvement of Agro-forestry Practices for Better Livelihood and Environment: BFRI (Forest) Component	(i) Needs to strengthen the activities	(i) Necessary steps to be taken to strengthen activities as per plan
	(4) Coordinated sub-project on Farming System Research and Development for Farmer's Livelihoods Improvement: BFRI (Forest) Component (Hill Ecosystem), Dr. Shamila Das, Divisional Officer,BFRI, Chittagong	(i) Needs to strengthen the activities	(i) Necessary steps to be taken to strengthen activities as per plan
	(5) Coordinated Project on improvement of agroforestry practices for better livelihood and environment: CU Component, Professor Dr. Tapan Kumar Nath, Institute of Forestry and Environmental Sciences, University of Chittagong	(i) Needs to strengthen the activities	(i) Necessary steps to be taken to strengthen activities as per plan
	(6)Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns: Soil Science Division, BARI Component	(i) Publication to be made on research results	(i) Publication of research results in different media
	(7) Coordinated sub-project on water management for enhancing crop production under changing climate: BARI component,Dr. Pijush Kanti Sarkar, PSO and Head, IWM Division, BARI, Gazipur	Reduce number of activities	To fullfill the objectives, activities to be undertaken
	(8) Coordinated Sub-project on Farming System Research and Development for Farmers' Livelihoods Improvement: BLRI Component Dr. Md. Mafizul Islam, Principal Scientific Officer Scientific Officer, BLRI, Savar, Dhaka	Model needs to disseminate	Activities to be taken in large area
	(9) Consequences of Tobacco Cultivation in Bangladesh, Dr. Tanvir Mahmud Bin Hossain, SSO, Agricultural. Economic Division, BARI, Gazipur.	(i) Final report submitted in time	(i) Highlighting the objectives final report to be prepared.
5.	(1) Development and up scaling of integrated pest management technologies in vegetable crops: A Coordinated Project; Dr. Syed Nurul Alam, PSO (Entomology), BARI	(i) Final report submitted in time	(i) Highlighting the objectives, final report to be prepared.
	(2) Integrated crop management for the improvement of jackfruit (Madhupur, Tangail) Dr. M.A Rahman, CSO, Plant Pathology Section, BARI	Technology needs to disseminate	Necessary steps to be taken to disseminate the technologies to the farmers
	(3) Coordinated Project on Soil fertility and Fertilizer Management for crops and cropping Patters: BSRI component, Dr. S M Bokhtiar, SSO and Head, Soils and Nutrition Division, BSRI, Ishurdi, Pabna	(i) Final report submitted in time	(i) Highlighting the objectives final report to be prepared.
	(4). Identification of Male Sterility in Onion Lines Dr. Md. Noor Alam Chowdhury, PSO, BARI	Finding needs documentation	Necessary steps to be taken for documentation
	(5 Coordinated sub-project on Farming System Research and Development for Farmers' Livelihoods Improvement: BARI Component-1(Plain Land Ecosystem-Northern & Eastern Zone),Dr. Md. Jalal Uddin Sarker, Chief Scientific Officer, OFRD, BARI, Gazipur	Needs more demonstrations	More demonstrations to be arranged

Monitoring of the SPGRs: Outcome, Actions/present status

Sl. No	Activity/Area/Observation	Output/Outcome/Issue	Actions/Present status
1.	Monitoring at the implementers level	48 SPGRs were reported to have been visited by the ARI's M&E cells members and the University designated personnel	Periodic monitoring and tracking the progress has proved to be rewarding
2.	Monitoring by the PIU-BARC and.	Besides desk monitoring being done at regular interval, the PIU-BARC team made visits to 22 SPGRs while at the local level	We are now receiving feedback from them in time.
3.	Field monitoring by the joint team of BARC	61 SPGR sub-projects visited by the 06 monitoring teams and reported feedback. Some very pertinent issues raised and remedy suggested/action taken	In all cases corrections done
4	Minor deviation from the planned activity.	In case some cases non-adherence to the approved plan and non-revision of the activity schedule observed.	The PIs have been reminded to be particular and those have been corrected by now.
5	Delay in procurement	Delayed material acquisition resulted in low expenditure.	This is a major problem both at the NARS and in the public universities. Lot of discussions held in this regard and the matter was raised even at the Executive Council meeting of BARC. There is visible sign of improvement at present.
6	Irregularity in funding	Delay in funding of the SPGRs occured due to non receipt of fund from the PCU-World Bank in three occasions. This caused disruption in timely execution of activities.	Matter has now been solved
7	Monitoring of the changes in social and environmental parameters.	Submission of the social and environmental monitoring report using the supplied format at periodic interval(say at least once in a year)	Notification given and discussions made always in the review and coordination meetings.
8	Documentation and dissemination of result	Successful achievement from SPGRs to be highlighted through different medias and validation/up scaling to be done.	By now, over 75 a number of TV programs have been broad caste and publications in the form of manual, booklet etc.

Major Findings/ observations in respect of SPGR success

- Two Aromatic Hybrid Rice Lines developed and found promising.
- Salt tolerant (up to 12dS/m) rice variety Binadhan-10 developed.
- Improved management technique of Jackfruit production developed
- Biotechnological intervention for tackling Leaf Curl Virus Disease in Tomato
- BARI Hybrid Summer Tomato- 8 variety & production packages developed
- Promising heat tolerant wheat varieties developed
- Developed disease, pest, drought, water-log and salt resistant sugarcane germplasm through
- tissue culture techniques and micro-propagation.
- Developed appropriate policy guidelines for future improvement of fruit farming and
- marketing in the hilly areas of Bangladesh.
- Lac for poverty mitigation of the small and marginal farmers is prospective
- Developed of disease resistant- cum-flash flood tolerant rice variety
- Safe vegetable production using IPM Technologies is developed
- Developed integrated disease management technique of soil borne pathogens
- Developed nursery and conservation technique of mangrove ecosystem
- Coastal water assessment and promotion of cropping pattern is developed
- Development of updated fertilizer recommendation guide for Bangladesh.
- Hydroponics, an alternative vegetable production technique and means of improved
- livelihood is developed
- Developed sustainable water use technique for hilly area of Bangladesh
- Generation of agro-technology for livelihood improvement of the haor community
- Seed bull to enhance smallholder dairy production
- MUN: A modern diagnostic tool for improvement of dairy nutrition is developed
- Participating farming technique of pure black bengal goat for genetic improvement is derived
- Gene banking technique of Indian major carps, breeding technique of baim fishes;Cryo
- preservation technique of Indian major carps are developed
- BRKB: an electronic knowledge hub on rice production technology is established
- Solar irrigation: An approach towards renewable energy use is developed
- Urea Super Granule applicator is developed and fabricated
- Self-propelled reaper and mini-power tiller are developed
- Developed of Jute based fabric.

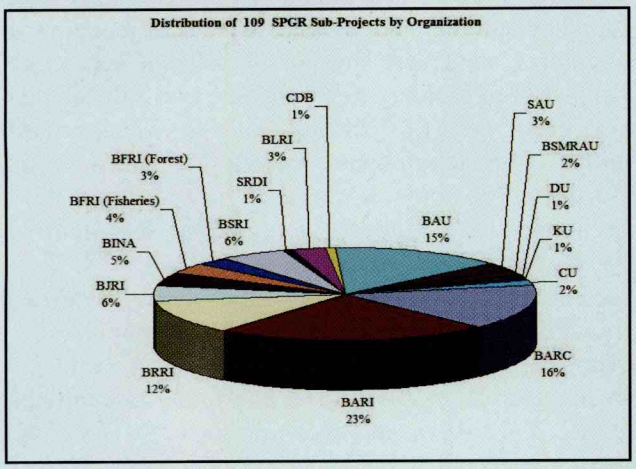
National Agricultural Technology Project (NATP)

The PIU-BARC in close collaboration with the agricultural Research Institutes (ARIs) and public universities is implementing Sponsor Good Public

Research (SPGR) sub-projects and Enhancement of Research Institutional Efficiency (ERIE) activities to develop demand-driven technologies, promote sustainable intensification and diversification of agriculture including capacity building of the NARS institutes towards attaining the project objectives.

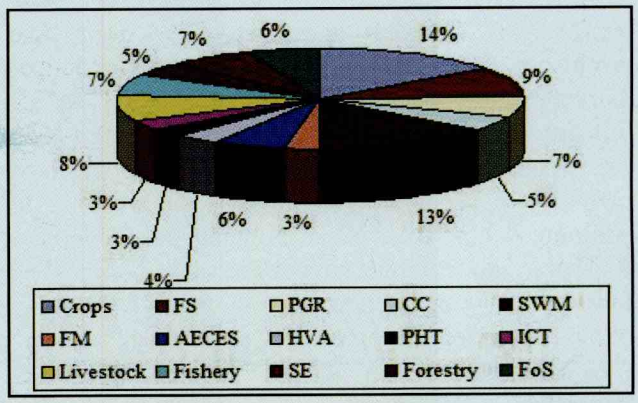
Project Development/Project financing

During 2012-13, PIU offered 3 sub-projects totaling 108 in six spells. Distribution of the 108 SPGRs as per implementing organizations are shown in Fig. 1. Considering the initial delay in start the duration of 29 sub-projects of the first stint and 58 in the second have been extended up to December 2013 by the Executive Council of BARC.Some new projects were under process of development. These are (i) Rejuvenation of degraded land, (ii) Enhancement of quality of jute fibre, (iii) Graphical user interface for open source biometric computing, (iv) Development of knowledge bank on fisheries, and (v) Development of knowledge bank on livestock.



Project Implementation

Out of 108, seven sub-projects have been completed as per thematic areas (16 sub-projects are within major crop sub sector, 15 soil and water management, 10 farming system research, 9 Livestock, 7 sub-projects each under the plant genetic resources, fishery and forestry; 6 sub-projects each under the un-favorable ecosystem and food safety, 5 sub-projects each goes to climate change issues and socio-economics, marketing, supply and value chain; and 3 sub-projects each under the farm machinery and productivity, post-harvest technology and ICT in agriculture). Activities and salient features of some of the implemented prospective SPGR sub-projects are briefly discussed below:



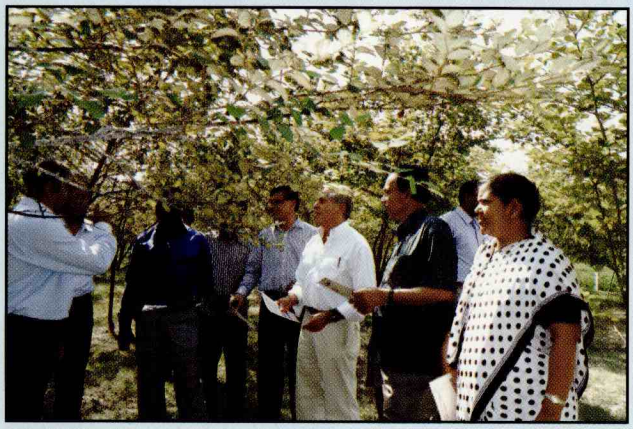
High Value Crops and Products

Identification of production package for high value horticultural crops through hydroponics culture: Tomato can be grown successfully in hydroponics culture. EC at around 2.5d/sm and pH upto 6.0 were found suitable for production and yield of capsicum. Among the three tested levels EC (2.5, 3.0, and 3.5 ds/m) and corresponding levels of pH (5.5, 6.0 and 6.5), EC of 3.0 ds/m and pH 6.0 were found best for tomato production. Cucumber can also be successfully grown in hydroponics culture. Among three treatments, the electrical conductivity level 1.5 ds/m is along with pH 5.5 produced heights yield. From the experiment tested with three levels of EC (2.0, 2.5 and 3.0) and corresponded pH levels (5.5, 6.0 and 6.5), the highest yield of bitter gourd was observed with electrical conductivity EC of 2.5ds/m and pH 6.0.

Capsicum cultivation in hydroponic culture

Research and technology generation in lac as a means towards elevation of poverty and income of the small and marginal farmers: Highest lac insect yields (9.75 kg/plant) in Sirish plants followed by Ber (7.50 kg/plant) were found. Predator attack is much higher in kartiki crop compared to baishakhi crop. Three sprays of neem seed kernel extract @ 10g crushed/litre of water at 10 days interval starting from first larval appearance in the field was found the most effective treatment. Jujube and sirish were the best hosts of lac insect for getting higher yield of

lac.Rajshahi, Pirganj and Joydebpur were the promising areas of lac cultivation in respect of marketable yield and lac insect mortality. Ten lac villages in five different locations have been established and more than six hundred different host plants have been brought under lac cultivation. In addition, 4 host orchards at Nilphamari, Joydebpur, Rajshahi and Pirgonj have been established. Lac farmers are being trained with improved technology of lac cultivation and processing under this project.

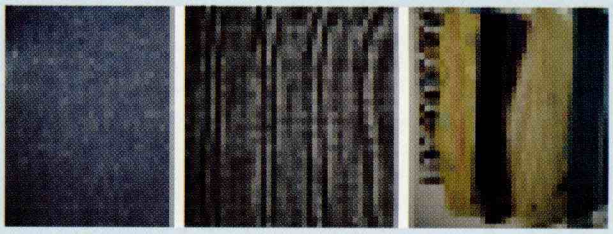


World Bank team visiting lac host orchard at Joydebpur

Development of hybrid summer tomato variety, production packages and on farm validation of the developed technologies: Fortysix new germplsam were collected including 12 hybrids and 35 cross combinations have been made out of which 21 new hybrids were produced through line tester approach. One variety has been released namely BARI Hybrid Toamto 8 and 2 new potentials hybrid lines are being waited for release. Molecular characterization is going on through RADP marker. A modern molecular laboratory has been established. Over 150 demonstrations were made country wide to validate the technology.

Newly released variety BARI Hybrid tomato 8

Production and development of the jute based blended fabrics in cotton processing system for textile uses: The properties of 10^s 50:50/Jute: Cotton blended yarn is the closest to 100% cotton yarn and strength is high. For further improvement of strength of the yarn viscose was added as a blending element. Ultimately different types of fabric e.g., Denim, Heavy Twill and Fine Fabric were produced with the above blended yarn and compared the properties (warp-way strength, weft-way strength, abrasion resistance, blending length etc.) with 100% cotton fabric. It has been seen that the properties of blended denim fabric are comparable and acceptable to the 100% cotton denim fabric. This innovatd technology of producing blended yarn has already been transferred to an industry through a MoU signed recently and another MoU signing process is on.



Germplasm Enhancement

Development of salt tolerant rice varieties through induced mutation and marker-assisted selection: Selected 24 rice germplasm were screened for salinity tolerance at the reproductive stage at EC level 6-8 dS/m. Two strains (viz., Pokkali and PBRC-37) were found as salt tolerant and four varieties as moderately tolerant. For introgression of salt tolerant genes into popular high yielding rice varieties, two salt tolerant rice genotypes (FL-378 and FL-478) were crossed with high yielding popular varieties (Binadhan-5 and Binadhan-7). Forty seven introgressed lines have been identified through foreground selection of BC_1F_1 populations of Binadhan-7 & FL-478. Two recombinants at distal end have been identified through recombinant selection of BC_1F_1 populations. Promising salt tolerant line 'PBRC-37' was evaluated in saline areas in 2011-12/13 and found salt tolerant at EC 10-12 dS/m, relatively earlier (127-132 days) and higher yield (5-6 t/ha under salt stress). Binadhan-10 can be cultivated in 40-50% of the saline area in both Boro (dry season) and Aman (wet season) seasons of Bangladesh.

Promising salt tolerant line PBRC-37 in saline area

Pyramiding Salinity and Submergence Tolerance Genes into BRRIdhan49 Through Marker Assisted Selection: For pyramiding salinity and submergence tolerance genes, FL478 and BRRIdhan52 (BR11-Sub1) were used as donors and BRRIdhan49 was used as recipient parent. Marker-Assisted Backcrossing technique was followed to *Saltol* along with *Sub1* in the genetic background of BRRIdhan49 and the approach will be completed by BC_2F_2 generation. Eighty-one background markers were identified to check recovery of recurrent parent (BRRIdhan49) genome through background selection. Selection for target gene (*Sub1*-foreground selection) was carried out by using gene-based marker RM8300 for submergence tolerance in BRRIdhan49*4/ BRRIdhan52. A total of 23 participants from NARS Institutes were trained on this area.

Application of microsatellite markers for screening and identification of iron rich rice genotypes: The highest iron concentration was found in Lal Gotal and the lowest was in Jota Balam. The local landraces had the highest iron (Fe) concentration. Molecular screening of iron rich rice genotypes was carried out by using ten SSR markers. Among the ten markers, RM17, RM21 and RM400 had showed the polymorphism with 52 rice germplasm. As in chemical analysis, local landraces were also performed better in iron content than the cultivated varieties. Thus, local landraces can be the good source for biofortification of popular rice cultivars using different crop improvement methods.

Genetic Enhancement of Sugarcane for Sustainable Productivity throughTissue Culture and Molecular Marker Techniques: Screening materials have been developed through callus induction and somaclonal plants regeneration using sugarcane varieties. Varieties Isd 18, Isd 20, Isd 34, Isd 35, Isd 36, Isd 37 and Isd 38 were found more responsive for red rot resistant (a) and red rot susceptible (b) somaclones of sugarcane regeneration. Among the red rot inoculated somaclones, one somaclone (Isd 37SC1) of the variety Isd 37 showed resistant reaction and seven somaclones were moderately resistant. Forty eight drought tolerant 61 salinity tolerant somaclones have been developed. MS Media + 10% CW containing Kn 0.5 mgl^{-1} and NAA 7.5 mgl^{-1} for initial establishmemnt, MS + Kn 1.0 mgl^{-1} for shoot multiplication and MS + NAA 5.0 mgl^{-1} for rooting were optimized. More than 5,000 micropropagated plants of varieties Isd 16, Isd 32, Isd 35, Isd 36, Isd 39 and Isd 40 were hardened and transplanted in the field. Micropropageted plants gave the highest cane yield than other planting materials and it was 1.4 times higher than three budded setts.

Development of Short Stature High Yielding Wheat Varieties Tolerant to High Temperature: A total of 107 advanced lines were collected and evaluated, out of which seventeen liens were selected for crossing. 50 F_1, $72F_2$, $27F_3$, $29F_4$, $41F_5$ and 75 F_6 were selected in subsequent generations.Three very short and 9 medium short high yielding and disease resistant advanced lines were selected and planted in three locations with optimum and late seeding condition for comparing yield performance over the check varieties. Two very good, medium heights, disease resistant high yielding advanced lines (BAW 1135 & BAW 1151) have been identified for releasing as a variety.

Selected Advanced Line BAW 1151

Genetic enhancement of local rice germplasm towards aromatic hybrid rice variety development in Bangladesh: Considering demand and scope, research works on identification of component lines (A, B and R lines) from local aromatic rice germplasm for development of aromatic hybrid or quasi aromatic hybrid varieties utilizing those component lines have been initiated at Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU, Gazipur). By this time 100 aromatic rice germplasm have been tested against different CMS system and 33 A and B and 11 R lines have been identified. Two test quasi aromatic hybrid varieties have been identified and experimental hybrid seeds are being produced for multiplication test before being released by the NSB.

Quashi hybrid 1 (Flowering and at Maturity stage)

Identification and utilization of QTLs from rice wild relatives for high yield through use of microsatellite markers: A total of 430 simple sequence repeat (SSR) markers were screened for polymorphism between the parents. Among them 102, 108, and 89 primers were polymorphic between parents of BRRIdhan28/*Oryza rufipogon* (AN.105890), BRRIdhan28/*Oryza rufipogon* (AN.103404), and BRRIdhan29/*Oryza rufipogon* (AN.103404) crosses, respectively. A total of 657 individuals of three BC_2F_2 generations (234, 210 and 209 progenies of BRRIdhan28/ *Oryza rufipogon* (AN.105890), BRRIdhan28/ *Oryza rufipogon* (AN.103404), and BRRIdhan29/*Oryza rufipogon* (AN.103404), respectively) were grown in the field. Twenty two polymorphic markers were amplified for genotyping of 238 individuals of BR28*3/*O. rufipogon* (AN. 105890) population.

Pyramiding bacterial blight resistant genes into the genetic background of BR11-derived submergence tolerant rice lines: For pyramiding bacterial blight resistant genes, IRBB60 and IRBB65 were used as donors and BRRIdhan52 was used as recipient parent. In BC_4F_2 (BR9163-1-30-1-9) population, 4 plants with fixed BRRIdhan52 alleles were selected and promoted to further selection steps through artificial inoculation of BB. Among these, 3 plants showed moderate resistance (score-3). Background selection of these 3 plants also have been completed with remaining 8 markers and all the 3 plants showed 89 % background recovery of recipient parent BRRIdhan52. These 3 lines can be considered as pyramided BRRIdhan-Xa21_xa13 lines. Seedlings of these three plants have been transplanted in the field leaves were collected for furthe confirmation. In BC_2F_2 populations (BR9163-90-17), 20 plants showing fixed recipient alleles of BRRIdhan52 were artificially inoculated by bacterial blight isolates. Among them 9 plants showed moderate resistance (score-3). Background selection is going on with remaining heterozygous markers.

Molecular characterization of Tomato Yellow Leaf Curl Virus (TYLCV) in Bangladesh and development of TYLCV resistant tomato using recombinant DNA technology: Among 46 isolates of Tomato Leaf Curl Virus (ToLCV), complete sequencing of 'A' genomes of 32 ToLCV isolates has been done on both strands which confirmed high level of polymorphism. *Agrobacterium* mediated transformation protocol confirmed for tomato and about 500 samples from 32 isolates sequenced. Two plasmid vectors with *nptII* and reporter genes constructed and used for optimization of genetic transformation protocol for a BARI released tomato variety. Two new vectors for transformation being constructed. Transgenic tomato plants with *gus* and *nptII* genes confirmed. Presence of seven strains of Geminiviruses belonging to three major groups was confirmed in tomato crops from Bangladesh. In the transformation part of the research, an optimised protocol for genetic transformation of tomato has been developed and insertion of the transgenes has been confirmed by PCR and GUS assays, respectively.

Regeneration of Transgenic Tomato Plant

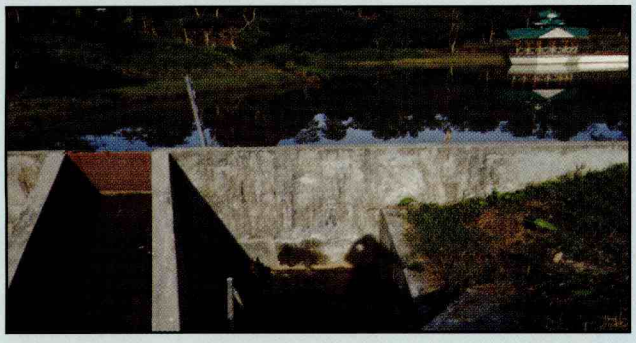
Development and Utilization of Bangladesh Rice Knowledge Bank:

Two baseline surveys were conducted among the Sub-Assistant Agriculture Officer (SAAO) of DAE and farmers of common interest group (CIG) with pre-structured questionnaire. The number of responded SAAO was 300 from all over the country whereas the farmers were 150 from 15 selected CIG (10 from each group) of 15 pilot upazila. About 165 colorful fact sheets on different rice technologies are developed and uploaded in BRKB. Some publications on rice such as 'Training module with 160 fact sheets', 'Flip chart for farmers' training', 'Characteristics of BRRI varieties, 'Rice production through questions and answers' 'Problems and solutions of rice production' are produced in Bangla according to the demand of BRKB users' and uploaded. For effective dissemination of rice technologies using BRKB about 5,000 CD, 3,000 posters, 2,000 stickers 1,000 bookmarks and 500 leaflets on BRKB have been distributed among the GO, NGOs and private sector extension personnel. Moreover, four workshops for development and validation of BRKB materials and 12 three-day trainings on utilization of BRKB for field level key officers of DAE associated with NATP-FIAC and service provider (Computer operator) of UISC were organized. This sub-project has been included in the Prime Minister's digital Program'.

Users' Group meeting in pilot upazilla at FIAC (NATP)

Farm Machinery and Water Management

Sustainable Management of Available Water Resources of Unfavorable Hill Ecosystem: Estimation of existing available water in two rivers namely Chengi, Myni and three Charas namely Chenginala, Komolchari and Noyonpur in hilly areas over time has been completed. In technical aspects management of water related different activities such as Construction of rain water harvesting reservoir, training of Chara through construction of dam, barrage, diversion structure , Installation of pumps, installation of ring tube well and other activities have been completed. Already eight rain water harvesting reservoirs, 43 pumps and 8 ring tube well have been installed on participatory approach at both research station and field level.



Rain Water Harvesting Reservoir of 'Zero Energy Irrigation' at HARS, Khagrachari.

Design,development, modification and introduction of self-propelled reaper and mini- Power tiller to augment crop production: Fabrications of self-propelled reaper and mini-power tiller have completed at BRRI Research Workshop as per new specifications. During the field operation of the reaper with 1.2m head, the average field capacity of imported reaper was found 0.204 ha/hr (50.38 decimal/hr). On the other hand, the average field capacity of BRRI developed self-propelled reaper was found 0.272 ha/hr (67.30 decimal/hr). The field capacity was found 0.231 ha/hr (57decimal/hr). The average fuel consumption of imported reaper and BRRI developed self-propelled reaper were 0.733 l/hr and 0.825 l/hr respectively. Time required for harvesting including binding and collecting rice and wheat by the 1.2m reaper were 67.23 and 75.13 hr/ha, respectively. But the manual harvesting time for rice and wheat were 4-6 times more. About 70-78% harvesting cost can be reduced using reaper over manual harvesting with the equivalent labor savings of 77-83%. Reaper will be beneficial for the farmers when their annual use of machine exceeding 4.0 hectares for harvesting rice and 2.5 hectares for harvesting wheat. The overall performance of the BRRI developed self-propelled reaper was better than that of imported reaper in Bangladesh contest.

Rice harvesting by developed self-propelled reaper

Development and adaptation of solar pump irrigation system under eco-friendly environment: A solar pump of one hp capacity has been developed in BARI for surface water lifting. The average discharge of BARI developed pump is 240 l/min which is operated by 900 W_p solar panel. Three submersible solar pumps (PS 1200) each of 1050 W_p capacity were installed in Jamalpur, Magura and Barisal for irrigation. Drip irrigation saved about 50% water than furrow method. Command areas for drip and furrow irrigation for 1050 W_p solar pump was 1.80 and 2.70 ha, respectively. Solar pump was found profitable for irrigating vegetables (BCR>2). Command area of 1050 W_p solar pump for boro rice was 0.75 ha. Solar pump was not economic for irrigating boro rice (BCR=0.18). Monocrystalline solar panel was found better than poly crystalline solar panels and among six solar pumps, BARI developed solar pump and China made (PS1200) solar pump were found suitable for surface and ground water lifting, respectively Drip irrigation saved about 50% water than furrow method. Command areas for drip and furrow irrigation for 1000W_p solar pump were 1.80 and 2.70 ha, respectively. Solar pump was found profitable for irrigating vegetables (BCR>2)

BARI developed solar pump in operation

Post Harvest

Assessment of Post-harvest Losses and Improvement of Post-harvest Practices of Major Fruits and Vegetables of Bangladesh: Among the selected fruits, highest post harvest losses from growers to consumers level was occurred for papaya (43.42%) followed by jackfruit (29.62%) and mango (28.92%). Highest post harvest losses was observed for brinjal (32.03%) followed by tomato (31.09%), cabbage (24.94%) and cucumber (24.28%). Plastic crate lining with newspaper was selected as good package for minimizing physical damage during transportation. Chlorine wash (tomato, brinjal, and papaya) and/or hot water treatment (mango, papaya) was found to be beneficial for reducing diseases or decay and physiological loss in weight during storage. Wrapping with newspaper was identified as effective practice both for transportation and storage of papaya. In cucumber, 0.5% perforated and 0.09 mm thich polythelyne bag was also observed suitable for transporting and storage of cucumber. Keeping wrapper leaves surrounded by 'Head' was observed as acceptable practice for transporting cabbage for minimizing physical damage and weight losses. Applying alum or lime paste on stem butt end of cabbage was found beneficial for minimizing 'Head blemish' and disease infestation. It was found that the quality of jackfruit chips remained good up to four month of storage, particularly in nitrogen flashed commercial packages and metalex foil pouch. The vinegar pickling was found also good up to the same period in hermitical capped glass bottles.

Disease Management

Surveillance of seedling diseases of some important fruit species in Bangladesh with molecular characterization of pathogens and eco-friendly model development for their management: Ninety four nurseries were surveyed in different locations of 14 different districts. Among the 32 recorded diseases, a new disease, bacterial leaf blight was recorded in litchi and mango. Environmental factors showed direct effect on incidence and severity of seedling diseases of fruit species in the nurseries. Molecular characterization of *Pseudomonas syringe pv. syringae* collected from mango and litchi were studied and high genetic diversity was found among the isolates of every location as well as among the locations. BAU-Biofungicide was found as an excellent biocontrol means of controlling different fruit seedlings diseases. BAU-Biofungicide either alone or in combination with Bavistin showed superior effect as spray materials, seed treating materials as well as soil drenching for controlling the nursery diseases recorded in litchi and mango. Molecular characterization of *Pseudomonas syringe pv. syringae* collected from mango and litchi were studied and high genetic diversity was found among the isolates of every location as well as among the locations.

Development of threshold level (Seed health standard) of *Colletotrichum corchori* in jute seed: To fulfill the objectives, 600 jute seed samples were collected from different sources and locations of Bangladesh which comprises 15 breeder, 5 foundation, 7 certified and 573 farmers seed samples. All the seed samples were tested for germination and health status in the Plant Pathology Lab. of BJRI. Seeds samples were categorized on the basis of presence of % *Colletotrichum corchori* and categorized as 0.0%, 5%, 10%, 15%, 20% and 25% infected seeds for conducting further research. Experiments were executed in the laboratory, greenhouse and in the field at four Regional stations of BJRI.

Development of Integrated Disease Management Technologies for Soil Borne Pathogens: Twenty tow isolates of *Sclerotium rolfsii,* 13 isolates at *Fusarium* sp., 3 isolates of *Pythium aphanidermatum* and 47 isolates of *Ralstonia solanacearum* have been collected from different locations of the country. Screening of 16 lines of brinjal, 14 lines of tomato against bacterial wilt, 14 lines of brinjal and 4 lines of tomato against root knot nematode, 120 lines of groundnut, 22 lines of lentil against foot rot and 20 lines of chickpea against wilt diseaseshave beeb completed. Fungal isolates were tested at different temperature to ascertain of their optimum temperature for growth, four methods of biochemical test were executed for determination of virulence of *R. solanacearum*. Molecular characterizations of 10 isolates of S. rolfsii have been completed for first time.Three studies have been conducted for screening of variety/ lines against foot rot and wilt diseases of

lentil, chickpea and groundnut at Ishurdi and Jamalpur. Some excellent lines/ varieties have been identified and these will be used in the 3rd year demonstration for validation in the farmers' field.

Screening of lentil and chickpea against Mustard oil + Provax treated foot rot and wilt at Ishurdi

Development and up scaling validation of integrated pest management technologies in vegetable crops: BARI and BINA have developed 8 new technologies on different devastating pests of 5 vegetable crops. They are Bio-rational based management of tomato fruit borers, Resistant variety against tomato leaf curl virus, Management package against insect pest complex of country bean, Management approach against pod borer of yard long bean, Moderately resistant okra germplasm against insect pests and diseases, IPM of okra shoot and fruit borer, IPM packages against leaf eating caterpillars of cabbage/cauliflower, Management of common cut worm attacking aroids. BARI and BINA have completed 47 up scaling studies on IPM of brinjal, cucurbit crops, country bean and cabbage/ cauliflower pests at the project areas. During summer, 3-4 spraying of bio-pesticide along with the existing package can do IPM of brinjal more effectively. Application of poison bait trap along with para-pheromone trapping can effective control fruit fly of cucurbit crops.

Productivity Enhancement

Improved Potato Storage Facility for Farm Household

Two varieties (Lal pakri and Diamont) and two different sizes (small and large) of potato purchased from local market were stored in four different shelves. Each shelf contains four categories of potatoes (lal pakri-small, Lal pakri-large, Diamont-small and Diamont-large). All were kept in nylon netted sack. Each sack contains 10 kg of potato. In addition, ten small nylon netted sack of one kg potato from each category was placed in each shelf for determination of moisture content, vitamin C, total sugar and starch with the farmer's traditional practice as control. Sample potato is being taken at 15 days interval from 16 different cells of the shelves to find out the spoilage, sprout, moisture content, vitamin C, total sugar and starch.

The inside view of the improved potato storage bin

Utilization and management of sugar mills effluent water for irrigation purposes to increase crop production: Effect of irrigation by sugar mills effluent water of sugar mills (North Bengal and Faridpur) on crops (wheat, mustard and sugarcane) growth, yield and yield contributing factor eredetermined. Field experiments were designed in strip plot with three replications and two treatments a irrigation) and B (fertilizer). Irrigation treatments were: (a) Fresh water b) 50% fresh water + 50% waste water © Waste water. Fertilizer treatments were: (a) Recommended full dose of fertilizer (b) Half dose of fertilizer and (c) No fertilizer. Maximum yield for the crops (wheat, mustard and sugarcane) was found in irrigation with50:50 fresh and effluent water followed by the irrigation with sole effluent water. Effluent water mostly exerted positive impact on irrigated soils along with non significant negligible negative impacts.

Farmers visit the performance of Crop (Wheat) irrigated by sugar mills effluent water

A view of the wheat plot irrigated by effluent water:

Field experiments were designed in strip plot with three replications and two treatments a irrigation) and B (fertilizer). Irrigation treatments were: (a) Fresh water b) 50% fresh water+50% waste water. Fertilizer treatments were: (a) Recommended full dose of fertilizer (b) Half dose of fertilizer and (c) No

fertilizer. Maximum yield for the crops (wheat, mustard and sugarcane) was found in irrigation with50:50 fresh and wastewater followed by the irrigation with sole effluent water. Wastewater mostly exerted positive impact on irrigated soils along with non significant negligible negative impacts.

Development of Nitrogenous Bio-Fertilizer for Sugarcane with Free-Living and Associative Bacteria Using Biological Nitrogen Fixation (BNF) Technology: Results revealed that all the growth parameters except girth cane were influenced significantly in different genotypes grown without N-fertilizer. In respect of yield, they followed the trend: Clone B 34-104> CO 846> Isd 37> Isd 32> I 486-99> Isd 28. Among the genotypes, Clone B 34-104 showed higher yield of 122.66 tha^{-1} having no urea fertilizer, which might have the ability to fix atmospheric nitrogen through BNF with the found gram negative bacteria.

Field monitoring by BARC at BSRI farm

Livelihood improvement of farming community in *haor* area through system approach: The Crop and Agroforestry component conducted experiments both in the homestead land and crop land in a haor of Purbo Tethulia, Mohanganj upazila, Netrakona district since April 2010. In the homestead area, year round vegetable were intervened through community trial for the last three years including production of timber trees like mehogoni, lambu and fruit trees like mango, guava, jujube, litchi, lemon, papaya, jack fruit. Field trials on rice, vegetable, spices and oil crops were conducted to intensify and diversify the cropping pattern and as well as to utilize the fallow/waste land of the research site. In livestock area, experiments were conducted on layer, duck and fattening animal, on milching animal, artificial insemination, rearing of egg producing hen, duck and chemical evaluation of available feedstuffs. In fisheries component, experiments on cage culture in open water, perennial and seasonal pond culture, dry fish and fish pickle were done. Among these experiments, cage culture in open water has been proved to be a promising technology and fish pickle

Livelihood Improvement of Farming Community in Haor Areas through System Approach in haors of Purbo Tethulia, Mohanganj upazila, Netrakona district

was highly appreciated by all involved. Jinding duck and Fayoumi hen, supplimentary feeding for beef fattening and milking cows, artifial insemination were found to be very encouraging and acceptable to farming community. For fisheries, monosex tilapia was found more productive where Puti was found best for drying fish with chilli. The farm households' harvests fish from *haor* in monsoon and value addition increased 14-23%. A distinct value chain was observed in case of fishes, while other enterprises produced mostly for home consumption.

Socio-economics

Marketing and Value Chain System of Brackish Water and Marine Fisheries Products and By-Products in Bangladesh: Ten major species hilsa, pomfret, catfish, bombay duck, ribbon fish, coral, paisa, surma, captured shrimp bommaitta were selected from coastal areas (Cox's Bazar, Chittagong and Bagerhat). During peak and lean season large variation in market price of different types of fish studied were observed. Marine fish marketing system yet not so developed in Bangladesh and as a result, fish harvested are mostly available in coastal region and to some extent, in divisional city but not even all district towns. For all the major species of marine fish, values are added both in domestic and export market in supply chain system. Regarding marketing efficiency, percentage of fisherman's share was higher in export market compared to that of domestic market.The project addressed and examined the marketing system and determined the marketing margin and marketing profit of marine fish marketed both in domestic and export market.

Hilsha fish at Chittagog landing station

Drying yard of Jew fish for export

Collecting of fish by-product

Assessement of socio-economic impacts on oilseed research and development in Bangladesh: Four oilseed crops namely mustard, sesame, groundnut and soybean, and three districts for each crop consisting high, medium and low growing areas were selected for this study. Again, three *Upazilas* from each district were selected for collecting primary data from oilseed growers. A total of 180 households cultivating selected oilseed (improved & local) were interviewed from one district for each crop. Thus, total collected samples are 2160. Primary data were collected through a pre-tested interview schedule. Different econometric models along with descriptive statistics will be used. The proposed models are probit regression, production frontier, economic surplus model, import and export parity, and domestic resource cost.

Potentialities of Major Fruits Farming, Marketing System and Price Behavior in Hill Regions of Bangladesh: The average per capita income of Tk 45420/annum of the hill areas is lower than that of national average of Tk 57652/annum. Agriculture is the major (67%) income generating component but it contributed only about 36% of the total income. Farmers obtained 57%, 60% and 71% less yield for pineapple, banana and orange cultivation in compare to the research managed yield. The partial project analysis indicated that BCR is greater than one, NPV is positive and IRR is greater than opportunity cost of capital for all fruits cultivation which indicates that it is highly profitable for the farmers. Sensitivity analysis also indicates that fruits cultivation can earn profit under changing situation. The average price of banana, pineapple and orange in accessible areas were 23%, 26% and 36% respectively higher than those of less accessible areas. The post harvest loss of banana, pineapple and orange were 33%, 40% and 31% higher in less accessible areas in compare to accessible areas.

Harvesting scenario of pineapple and mango in Bandarban

Fisheries

Investigation on fish diseases and economic losses due to disease incidence: Thirty two bacterial strains were isolated from different diseased fish and characterized for the investigated of potential virulence status. Study in the three districts, overall parasitic diseases caused due to infectious by *Trichodina*, *Ichthyophthirius multifiliis*, *Dacty logyrus*, *Gyrodactylus* and *Argulus*. Prevalence of fish diseases has negative impact on aquaculture in the study area. The average prevalence of fish diseases in farmers ponds was noticed highest (27.0%) in Rajshahi district followed by Mymensingh (24.6%) and Sylhet (18.3%). The highest average loss as high as (BDT 30,023/ha/year) was found in the fish farmers of Rajshahi districts followed by Sylhet (BDT 24,197/ha/year) and Mymensingh (BDT 20,390/ha/year) districts. The overall average economic loss due to fish diseases was BDT 24,870/ha/year(12.9%).

Red spot in Catla (collected from Rajshahi)

Gene banking of improved broodstocks of Indian Major Carps (catla, rohu and mrigal) and development of breeding technique of three threatened species (mohashol, bagair and baim): Seeds from 9 sources (3 riverine sources viz. Halda, Padma & Jamuna and 6 hatcheries of three regions viz. Mymensingh, Comilla & Jessore) were stocked in separate ponds (2 decimal each) and their growth (length and weight) monitored for 6 months. Genetic characterization of three species through allozyme electrophoresis and genetic characterization of rohu and catla through microsatellite DNA marker have been completed. Riverine populations contained better genetic quality than hatchery populations. Cryopreservation protocols for rohu and mrigal spermatozoa were developed. Selective breeding of rohu and mrigal was completed. Collection and domestication of threatened species (mohashol, bagair and *baim*) were done properly. Breeding seasons of mohashol and *baim* have been identified through histological observation. Two induced breeding trials were conducted with *baim* using PG extract. A reasonable number of fry of *baim* have been produced which are being reared in ponds and in the laboratory condition under different experimental protocol. Successful ovulation, fertilization achieved in case of bagair but hatching did not occur. Success in induced breeding of mohashol, it seems, will require some more time.

Livestock

Studies on the Quantitative Trait Loci (QTL) of economic traits in Black Bengal goat: One hundred eighty five G_0 does were mated with 5 Black Bengal bucks so far from the inception of the project to September, 2011. So far 167 G_0 dose produced 336 G_1 kids. 4 Beetal Bucks were allowed to mate with the G_1 does to produce G_2 crossbred progenies as per experiment design of this project. Up to the March 2013, 269 G_2 kids were born. The G_2 kids when matured will be used to produce G_3 progenies i.e. back cross progenies. It is expected that back cross progenies will be obtained from September 2013. Seed of Black Bengal goat has been produced successfully. This stock is being multiplied for future breeding purpose. G_2 crossbred progenies have also been produced in Natore. The crossbred progenies had more birth weight and growth rate than G_1 pure Black Bengal goat. This was due to heterosis effect. G_2 does are being mated with pure Black Bengal buck to produce back cross progenies. G_3 back cross progenies production is also in progress. Husbandry of goat rearing of contract farmers has been improved resulted in increase in number of goat per family. Genotyping of bucks, does and kids is in progress.

A successful contact farmer and volunteer in Bandar

Approaches to develop broiler sir & dam lines from available genetic resources: Two male line broiler parents, male line white (MLW) & male line colored (MLC) were evolved. Three female line broiler parents, female line white (FLW), female line white2 (FLW2) & female line colored (FLC) were evolved. The white feather broiler attained 1200g at 6 weeks of age with FCR of 1.67. The colored strain grows slowly i.e. 883g at 6weeks of age with FCR of 1.91. Both the white & colored strains have high livability (98-99%) & dressing meat yield (76%). The 3rd generations already completed & 4th generation selected male & female lines are now running 20 wks of age. Yet to rear up to 35 wks of age for final selection.

BAU-bro white

BAU-bro red

Production of HYV vis-a-vis Indigenous Seed Bulls to Support Smallholder Dairying in Bangladesh: Highly significant differences showed in 182 selected dairy genotypes in daily and peak daily milk yield, lactation length, dry period and just significant difference in age of first heat and service while no significan difference at all in age of first calving, calving interval, post-partum heat period and services per conception. The 75% HF and H-SL-D genotypes produced significantly higher daily milk (13.91 litrers) while deshi cow produced 2.32 liters.The 75% HF and the highest lactation length, 306.0911.41±days and it was 242.73±8.89 days for deshi cows. The shortest length of age at first service showed 75% in HF925.86±2.01 months) followed by 50% HF, 62.5% HF, deshi and 50%SL cows having 26.10,26.10 32.31 and 33.17 months, respectively. Genotype X Environment study performed with crossbreed dairy cattle revealed Friesian – local (75% HF) genotype under high input environment and Friesian –local (50% HF) under low input environment would be the recommended genotype for use as cow and bull.

Young seed bulls in the Calf Rally

Isolation and molecular characterization of egg drop syndrome (EDS-76) virus in Bangladesh: Samples (Deformed egg, uteri and cloacal swab) were collected from l 226 sera samples from layer birds and overall seroprevallence was found 41.86% layer birds. Inoculum was prepared and inoculated into 11 days old duck embryo for the propagation of the virus for several times. The presence of virus was confirmed by macro and micro HA and HI tests. Till now 3 EDS virus have been isolated from field isolates. Molecular characterization (PCR of EDS specific hexon gene and PCR-RFLP) of 3field isolates completed. After molecular characterization no difference among the three isolates could be detected. All the isolates showed similar pattern of restriction site after digestion of the PCR products with restriction enzymes. On successful completion of the project, the isolated virus would be stored and used as seed virus for the development of vaccine.

Study on milk urea nitrogen (MUN) for improvement of dietary nutrition of dairy cows in Bangladesh: An investigation was done to know the protein status as well as milk urea nitrogen (MUN) of dairy cows in four different areas (Sirajgonj, Rangpur, Jessore and Noahali) of Bangladesh with 320 dairy cows at on farm study considering genotype, lactation stage, season and plane of nutrition. The cows were deficient in protein intake in most cases and the MUN values ranges 22-39 mg/dl. Another on station trial was done with 30 dairy cows to determine the optimum feeding levels of rumen degradable protein (RDP) to optimize MUN content

and the values fall within 17-22 mg/dl. It was observed that MUN depends on genotype, lactation stage, season and plane of nutrition. Finally, considering all the dataset of MUN, a user-friendly practical feeding guideline for dairy cows will be developed to utilize the expensive part of nutrients, protein, efficiently.

Development of an effective PPR vaccine seed from local isolate and its molecular characterization: Field outbreaks are being investigated by isolation of virus in Vero cell, by RT-PCR and sequencing. So far, twelve field isolates are available in the repository. Molecular characterization (partial sequence of F and N genes) of 11 field isolates completed (Gene Bank Accession available). The similarity of N and F genes among all the Bangladeshi isolates were 94.5-99.6% and 98.7-100%, respectively and clustered under lineage 4. Two unique amino acid substitutions were found on N protein of recent lineage IV Bangladeshi isolates. Three isolates are being passaged in Vero cell and so far were 22nd passage completed, CPE "rounding & clumping of Vero cells" produced at 3rd day onward. Viruses of different passages are leveled and stored in -80°C and in liquid nitrogen. Partial sequence of 9th passaged virus completed. Some early substitution noticed. Molecular methods for the detection of F and N genes are available.

Environmental Assessment of Aquatic Pollution and Biodiversity of Some *Lakes* of Dhaka City: Heavy metals in water like Zinc, Chromium, Cadmium, Lead, Copper, Nickel and Manganese were anlaysed during winter, summer and monsoon season. Chromium and nickel was recorded below detection level (BDL) in Gulshan and Dhanmondi lake. Other heavy metals were found to be higher in Gulshan lake than Dhanmondi lake year round. Lake soil samples were found to be acidic in nature. Organic matter also found higher in Gulshan lake than Dhanmondi. Some heavy metals of lake soil including Zinc, Chromium, Cadmium, Lead, Copper, Nickel and Manganese were found to be present in Gulshan and Dhanmondi lake. Heavy metal concentration was higher in Gulshan lake than Dhanmondi lake during summer and monsoon period. Biologically the number of plankton of lake water showed that average number percentage was higher in Gulshan lake. Total benthos in Gulshan lake were ranged from 420 to 2760 nos /m^2. In Dhanmondi lake it was ranged from 520 to 2250 nos /m^2. Average benthic organism numbers were found to be higher in Gulshan lake. Aquatic micro fauna and benthic fauna were identified. No specific relations were establishing between phytoplankton and zooplankton concentrations. Snails and clams were found in abundance in Dhanmondi lake.

Coordinated sub-project on water management for enhancing crop production under changing climate - a coordinated project of BARI, BRRI and BINA: Experimental results from all the eight locations confirmed that supplemental irrigation is required for optimum yield of Aman. Optimum yields of Rabi crops are not also possible without irrigation in all the eight locations. Groundwater is the main source of irrigation water in the 7(seven) study sites except Barisal where surface water is the only source of water for irrigation. In Hathazari site, there is scope for using both ground and surface water. Both infrastructural development and motivational supports are required for the area to explore the potential. Researchers' recommendation was found better over farmer's practice both for rice and non-rice crops. Specific few important findings of concerned implementing organizations (BARI, BINA and BRRI) are summarized as:

BARI: Technologies of crop production using optimum irrigation water are developed and disseminated through farmers training. Irrigation at alternate wetting and drying (AWD) used by farmers during Boro season and two to three irrigations at different growth stages assist in obtaining highest yield for Rabi crops. Rain water was harvested in T. Aman fields and used for supplementing irrigation. Trend of groundwater fluctuation in the study areas is being assessed. Irrigation treatment on growth stages of potato during Rabi season after T. Aman rice harvest was compared with farmers practice in Birgonj. Irrigation treatment at field capacity (FC) level on the stolonization and tuberization growth stages produced significantly higher potato yield (29.29 t/ha, Crop Variety. Diamont), which was followed by farmers' practice.Like potato, irrigation treatments for wheat cultivation at different growth stages were compared with farmers practice..

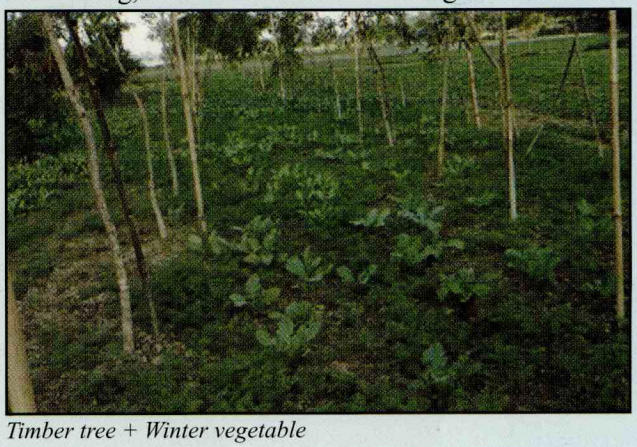
BINA: Three cropping patterns i.e., T.aman-Fallow-Boro, T.aman-Mustard-Boro and T.aman-Wheat-T.aus for Mymensingh district and T.aman-Lentil-Sesame, T.aman-Mustard-Mungbean and T.aman-Chickpea-Jute for Magura district were followed. After harvest of Rabi crops, boro rice was transplanted and Kharif-I crops were sown during 2012 and 2013. Based on water resources a year round cropping sequence was developed for Magura: T. aman (Binadhan-7)-Rabi (Lentil/Chickpea/ Mustard)-Kharif-I (Mungbean/Sesame/Jute), for Mymensingh: T. aman (Binadhan-7) - Rabi (Mustard) - Boro (Binadhan-7, Binadhan-5 and BRRIdhan-28).

Mustard and wheat seeds were sown in the same fields after Aman rice harvest in Mymensingh and likewise lentil, mustard and chickpea were sown in Magura. All these non-rice crops were cultivated under irrigated condition and 4 irrigation treatments: (i) at field capacity levels, (ii) irrigating at vegetative stage, (iii) irrigating at vegetative+flowering stages, and (iv) irrigation at vegetative+flowering+pod-filling stages.

BRRI component: The average yield of HYV Aman varieties (3.75 t/ha) was higher than the local varieties (2.60 t/ha) if planted in optimum time. BR22 could yield better even if planted in the 4th week of September. Slightly higher yield was obtained with levee management (2730 kg/ha) compared to the farmers practice (2550 kg/ha) in Bakergonj, Barisal during T. Aman 2012. Supplemental irrigation was applied in rice fields during T. Aman seasons of 2011 and 2012 which produced higher yields over rain-fed condition. Maximum groundwater table depth in Satkhira and Kapasia were 5.20 m and 4.93 m, respectively during dry season of 2012. Field trials for non-rice crops were conducted in Kapasia (Lentil) and Satkhira (Mustard, Wheat and Potato) sites during Rabi season of 2012 and 2013. In 2012, highest yield was obtained with researchers recommended irrigation practice compared to farmers' practice and irrigation at 50% depletion of available soil moisture. Higher yield was obtained with Farmers' practice and AWD (15-20 cm) treatments. AWD (15-20 cm) could save 10-25 percent irrigation water compared to the farmers' practice. Due to higher yield loss AWD (30 cm) and AWD (40 cm) are not suitable for irrigation scheduling. Improved management practices showed higher yields in mustard (1.2 t/ha), wheat (3.5 t/ha), and potato (27 t/ha), receptively under the conjunctive water use (irrigation + rainfall) of 123 mm, 163 mm and 273 mm.

Coordinated sub-project on improvement of agroforestry practices for better livelihood and environment:

BAU component: This component undertook different activities viz. Benchmark survey, tree sapling transplantation, winter and summer vegetable cultivation, tree growth observation, farmers training and impact of these activities on economic, social and environmental aspects.Total 7886 sapling of 12 different fruit, timber and soil conserving species were transplanted on 6.85 ha of char land. Different winter vegetables/crops species are cultivated in association with planted different tree species under 9 different experiments. Four summer vegetables/crops species are cultivated in association with planted different tree species under 6 different experiments. Total 280 farmers (140 from Mymensingh and 140 from Jamalpur) were trained about agroforestry and environment aspect. Impact of the project in the Char areas of Mymensingh and jamalpur was observed by monitoring, field visit and interviewing the farmers.



Timber tree + Winter vegetable

Fruit tree+ Fruit tree + Winter vegetable

BSMRAU component: BSMRAU activities are focused on crop land with jackfruit trees in the boundaries associated with new plants of jackfruit, malta, litchi, and various vegetables, etc. within the crop land at different sites in Gazipur and Narsingdi Districts. Farmers in adjacent area are motivated and they took part at the initiative of the project. It is also promoting agroforestry in interspaces in jujube and mango plantation in Paikgacha upazila in Khulna district. In all the sites the farmers are getting additional crops in the agroforestry practice. Already there is some scaling up the activities.

KU component: KU concentrates on gher land agroforestry practices and interaction of the practices on shrimp culture. The activities in Dumuria upazila in Khulna District are encouraging and the farmers seem to be motivated. The farmers in the adjoining areas have started practicing the similar activities at their own initiatives with the advice of the people who are being supported through the project.

However, the activities at the other site at Kaliganj upazila needs continuous efforts to motivate the farmers. This process is being continued. Perennial trees and annual crops are being cultivated in the dikes of gher landuse in order to develop gherland agroforestry models. Suitable tree species and associated annual crops and their production combinations round the year have been studied. Eff ects of leaf leaching on water quality in relation to fish production have been studied and management developed.

IFESCU Component: IFESCU is promoting participation of the tribal people in hill agroforestry for better productivity through community mobilization. To this end, it has formed 30 community groups for promotion of management of local agroforestry practices. The institute has involved the communities in hill farming. The communities are now managing their interventions by themselves with the support from the project.

BJRI component: BJRI initiative consists of encouraging the farmers to grow late jute seed in fruit tree orchards and homesteads in combination with tree species and vegetables at three sites in Dinajpur, Rangpur, and Faridpur districts. The tree species in the orchards are mango and litchi. In some case mahogany, neem and *Albizia procera* are planted and the crop land boundaries and homesteads. It has involved the farmers to grow jute seeds in fruit tree orchard at different sites in Dinajpur, Rangpur and Faridpur districts.

BFRI Component: BFRI endeavors growing of medicinal plants in the hill communities through active participation of the communities.Three intervening sites fall in Bandarban, Rangamati and Khagrachari districts.The communities are encouraged to grow the plants in combination with other crops and trees.The communities feel that marketing channel for selling the produce must be established.

Coordinated sub-project on Carbon Sequestration in Soils of Bangladesh

BRRI Component: Total number of 2188 soil samples have been collected from 10 AEZs (1-10) of which samples from 4 AEZs (1, 3, 4 & 9) have been analyzed for Organic C. Results show that C stock in low land soils is higher than that of high land and medium high land soils. C stock was found to decrease with increasing soil depth irrespective of land type. In soils without rice crop, the rate of CO_2-C emission was higher in earlier stage of incubation irrespective of organic materials added both under moist & submerged condition. Soils incubated with rice straw emitted more CO_2 than incubated with cow dung, poultry manure and rice root. No significant effect of applied organic materials and water regime was observed on organic carbon content of incubated soils grown with rice. CO_2-C emission gradually increased up to 60-70 DAT in T. Aman and then decreased at around 95 DAT and then again sharply increased irrespective of tillage practices. In Boro rice field CO_2-C emission gradually increased up to 50-60 DAT and then decreased around 75 DAT and then again there was slightly increasing trend irrespective of tillage methods.

BINA Component: Total number of 1680 soil samples collected from 7 AEZs (12-17) of which samples from 2 AEZs (12 & 15) have been analyzed for organic C. Carbon stock in low land soils was also found higher than that of high land soils and was found to decrease with increasing soil depth irrespective of land type. In soils without rice crop, almost similar results were found regarding CO_2 emission over time. Besides, CO_2 emission was found higher under moist soil condition than submerged condition. Among the organic materials, CO_2 emission rate was found higher with poultry manure treated soils. But no significant variation in cumulative CO_2 emission was observed among different organic material treatments. In the soils with rice crop, organic matter content was found to increase with increasing the rate of application of organic materials. Soil organic matter content was found higher in continuously flooded soils than moist soils. In T. Aman rice field, CO_2-C emission gradually increased up to 90 DAT and then decreased gradually until 120 DAT and then sharply until 150 DAT irrespective of tillage practices. CO_2-C emission was found higher with traditional tillage coupled with rice straw incorporation. In boro rice, CO_2-C emission was found highest at 15 DAT and then decreased gradually until 150 DAT. Almost similar results were found at BINA. CO_2-C emission gradually increased until 60-90 DAT in T. Aman and 30 DAT in Boro rice and then decreased. Poultry manure emitted highest CO_2-C followed by cowdung and rice straw and the lowest was with control treatment in both the seasons. The highest SOC was observed in rice straw incorporated treatment followed by and the lowest with control treatment.

BSMRAU Component: Total numbers of 2160 soil samples were collected from 9 AEZs (21-30) and analyzed for organic C. Carbon stock in low and medium low land soils were found higher than that of high and medium high land soils and were observed to decrease with increasing soil depth irrespective of land

type. In soils without rice crop, almost similar results were found in CO_2 emission over time. CO_2 emission rate was found higher with poultry manure than with other organic materials. C accumulation in soil was also found higher under submerged condition than moist condition. In soils with rice crop, organic matter content was also found to increase with increasing the rate of application of organic materials. Rice straw incorporation had significantly higher CO_2-C emission than straw mulch and control. Regarding carbon accumulation in soils, the highest accumulation was observed with minimum tillage coupled with rice straw incorporation. Among the organic materials, initial rate of CO_2 emission was higher in poultry manure treatment followed by cowdung. Although the initial rate of CO_2 emission was less in rice straw but it emitted more CO_2 for longer time. Among the organic materials, organic carbon sequestrated more in cowdung treated plots followed by poultry manure and rice straw.

Pot experiment with organic residues

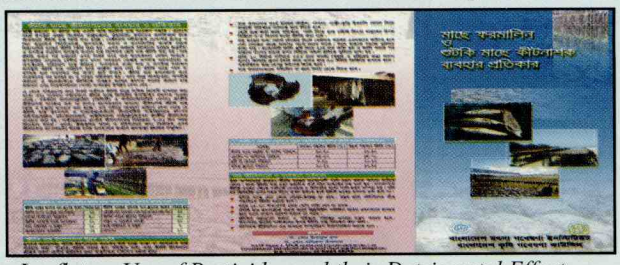
Food Quality and Safety

Coordinated sub-project on contaminants and adulterants in food chain and their mitigation: The sub project is comprised of six components including BARC as the coordination unit. Component wise activities undertaken during the reporting year are as follows:

BARC component: Visited Chapai Nawabgonj mango production and trading areas, organized two research progress review workshops and one expert consultation meeting. A special workshop was organized at Bholahat, Chapai nawabgoj on use of chemicals in fruit emphasized on mango ripening. On the other hand, four training programs were organized at different locations of the country to promote awareness and knowledge improvement of the stakeholders on safe and hygienic production of dry fish, meat, milk, etc. As per recommendation of the workshop, a survey was conducted in the major market of Dhaka city to assess status of adulteration practices and its status in different food items like, vegetables, fruits, eggs, meat, fish, and fish products and various processed foods and produced a report. Two leaflets on contamination of adulterated milk, meat and use of formalin in fish, etc.

BARI Component: A survey was conducted at four locations of Rajshahi district to assess the present status of the usage of pesticides and ripening chemicals in papaya cultivation. The results revealed that none of the farmers followed IPM approach and most of them applied pesticides as per prescribed doses but higher frequencies (15-25 times) at 7-10 days interval and harvested the fruits after the withheld period of 7-10 days of last spray. The farmers harvested papaya at green stage and sold as vegetables. The residuals of ripening chemical (ethephon) used in tomato, banana, papaya were found in some of the samples with a maximum range of 1.22 ppm which was within the maximum residue level (MRL) of 2 ppm, as recommended by FAO. In case of mango, all sample (21) contained ethephon residue ranging from 0.14 to 4 ppm. Only 06 mango samples exceeded MRL. The presence of residues in mango and papaya ranged 0.11-0.88 ppm in the edible portion which was within the MRL. Mango, banana and papaya samples were collected from farmers/traders/whole sale market and their heavy metals contents were determined. As, Pb, Ni, Fe, Cr, Al were detected in 8 samples with the residual levels in papaya. In case of banana, only Pb, Ni, Fe, Cr and Al were present in two collected samples. Similarly, Ni, Fe, Cr and Ag were detected in collected mango samples.

BFRI component: About 64% of the marketed feed ingredient samples both animal and plant origin was of poor quality (adulterated). On the other hand, the nutritional quality of commercial nursery (18%, 31% and 51%), starter (24%, 34% and 42%), grower (29%, 36% and 35%) and finisher feeds (31%, 40% and 29%) were highly satisfactory, satisfactory and not satisfactory, respectively. Bioaccumulation of six heavy metal concentrations like, copper (Cu), chromium (Cr), lead (Pb), iron (Fe), aluminium (Al) and nickel (Ni) in Goby (*Apocryptes bato*) fish and shrimp of Karnafuli (*Palaemon karnafuliensis*) muscles, sampled from the River Karnafuli, Chittagong were determined and detected Cu, Cr, Pb and Ni which were within the safe limit. But the bioaccumulation of Al and Fe were in high



Leaflet on Use of Pesticides and their Detrimental Effect

concentration in almost all samples. These were also higher in soil samples. Water from the Passur river showed that heavy metals like Cd, Cr, Cu, Fe and Pb were within the permissible level for human health but Zn concentration exceeded the limit. Bacteriological investigation of widely spread koi fish (*Anabas testudineus*) from farmers pond revealed significantly higher bacterial count (8.44±0.04 log CFU/ml) compared to the BFRI ponds sample (7.92±0.17) ($p \leq 0.05$). Similarly highest TVC was found in mud and water samples compared to those of BFRI ponds. Bacteria isolated as *Pseudomonas* spp. (21.40%), *Aeromonas* spp. (33.46%), *Vibrio* spp (14.78%), Salmonella spp. (21.40%) and E. *coli* (8.94%), indicated contamination of those some health hazards microorganisms. Biochemical tests and test by Formaldehyde Detecting Kit in aqueous media showed presence of naturally occurring formaldehyde in marine fish like, Bombay duck (*Herpodon nehereus*) was found to be 40-60 ppm which showed increasing trend after preservation in frozen condition. In contrast, freshly caught carp fish like rohu, tilapia did not show the presence of formaldehyde.

BLRI component: Broiler meat collected from both Farm and Market of Joypurhat showed the presence of antibiotic residues such as Ciprofloxacin (96.40 & 168.80µg/kg) and Sulfonamide (86.50& 217.50µg/kg) which were higher compared to the MRL of 30µg/kg and 100µg/kg respectively. Investigations into the raw meat (beef) samples indicated the total viable count (cfu/gm meat) was higher at two different times (2.3×10^5 to 1×10^{10}) in Savar, Dhaka, Sirajgonj, Pabna and Joypurhat. The Coliform count in collected raw meat samples from Savar, Dhaka, Sirajgong, Pabna and Joypurhat was higher (1.5×10^3 to 1.5×10^7) compared to the recommended level at 12:00 pm and Savar and Dhaka meat samples was almost standard to recommended level. Two meat samples collected from super market had below recommended level of the total viable count (cfu/gm meat) and the Coliform count at two different times while the rest three had higher at two different times.Vendors' milk samples collected from Savar, Dhaka, Joypurhat, Rangpur, Chittagong, Gazipur, Pabna and Sirajgonj indicated that 6.67 to 64%, 6.67 to 25% and 40 to 74% samples were found to be adulterated/contaminated with formalin, cane-sugar and pond/river water, respectively except starch and 25% of commercial milk showed presence of sugar. On the other hand, 10, 18.75 and 10% milk samples in Savar, Dhaka and Sirajgonj locations were adulterated/ contaminated with hydrogen peroxide. Eggs were collected from different markets of poultry producing areas such as Dhaka, Chittagong, Sirajgonj, Joypurhat, Munshigonj of Bangladesh. Ciprofloxacin residues in eggs in all locations were found higher compared to the recommended MRL and more than 80% egg samples were found to be higher content of Sulfonamide, Oxytetracycline and Enrofloxacin against their MRL. A total of 32 feed samples were collected, out of which 11 were cattle feeds and remaining 21 were poultry feeds. Preliminary observations revealed that 54.54% of cattle feeds and 47.62% were shown positive of leather meal were shown presence of leather meal in compound feeds.

BRRI Component: A total of 203 rice and rice based food product (Popped rice, puffed rice and flattened rice) samples were collected for heavy metal estimation from farmers' fields, market retailers and imported rice from Govt. silos. Cadmium (Cd) content in rice samples collected from nonindustrial areas was ranged from 0.000 mg/416.01 gm to 0.125 mg/416.01 gm while rice collected from the field adjacent to the industrial area found to be contaminated and having the risk level of daily intake of Cd (>0.07 mg/416.01 gm. Chromium content in all the samples, excepting that from the industrial zone, was lower than the risk level of daily intake (>0.35 mg/416.01 gm). Lead content of all samples from any of three sources was within the limit of MRL of daily intake of Pb (>0.25mg/416.01 gm). One hundred and sixty four rice samples were investigated for fungi association, which were collected from different CSD and LSD food storages of south-western Khulna and Satkhira districts. Fungi were identified as *Aspergillus, Penicillium, Fusarium, Rhizopus, Curvularia, Tricochonis and Alternaria* sp. Generally infection was low. Average incidence of *Aspergillus* (1.87%) was higher followed by *Penicillium* (1.60%), *Rhizopus* (1.26%) and *Fusarium* (0.79%) irrespective of the storage. Fungal infection ranged 0.57-2.43% in CSDs and 0.66-2.53% in LSDs. Infection level did not increase with storage period irrespective of storage or origin. Among 41 out of estimated 46 rice samples, none of them contained aflatoxin B1 above the UNICF/WHO/FAO maximum permissible level 30 µg/kg (ppb) in foods for human consumption. Only 5 samples contained aflatoxin B1 ranged from 5.39-8.08 and 3 samples contained 0.06-0.13 µg/kg aflatoxin B2.

BAU Component: This component dealt with the assessment of contaminants and adulterants in processed food products. Sample of the selected items of spices powder like, turmeric, chili, zinger, coriander and mixed spices and miscellanies products mustard oil, coconut oil, chanachur and noodles were collected from the local market and analyzed the

commercial parameters. such as, moisture, harmful food colors, acidity, preservatives selected minerals content (arsenic, lead, copper, zinc and tin), and microbial load In spices powders, moisture, total ash, non-volatile ether extracts and total bacterial count were found to be higher than that of Reference Value (RV). The tested oils were found to contain very high moisture, insoluble impurities, acid value, low saponification and iodine value, and low erucic acid (Mustard oil) indicating adulteration and low shelf-life. However the soybean oil fulfilled all the parameters of RV of BSTI. The moisture, total ash and acid value of all the Chanachur samples were found higher than that of RV indicating adulteration and susceptibility to rancidity.

Coordinated sub-project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns

Six NARS institutes and one public university is collaborating in its implementation strategies having common project objectives of determining location specific fertilizer requirements of crops and cropping patterns but each with specific AEZ of the country. BAU is dealing only with the micronutrients. Iimportant findings of the concerned implementing organizations are summarized as:

BARI Component: Fertilizer recommendation for 12 major cropping patterns at 9 locations in 7 AEZs (AEZs 3, 4,11, 12, 25, & 26), Single crop based fertilizer recommendation for vegetable and field crops at 7 locations (AEZs 3, 11, 12, 20 , & 26), Fertilizer recommendation for quick growing fruits (Banana, papaya and Moringa) at 4 locations, for fodder crops (Napier, Garman grass and Para grass at 4 locations, for intercropping systems (Banana + potato; chickpea with linseed) at two locations have been conducted. In most of the locations and cropping patterns 25% higher dose of NPK were found to produce higher NPK were found to produce higher yield and economic benefits of most of the crops over the present yield and economic benefits over the present recommendation. Similar results *i.e.* 25% higher dose of recommendation at different locations. In all the locations 25% higher dose of NPK were found to produce higher yield and economic benefits of all the tested crops over the present recommendation Yield and gross margin of Para and German grasses were found highest with 25% higher dose of NPK over the present recommendation at Barind, Rajshahi and Bagra, respectively.

BINA component: A total of 365 composite soil samples have been collected within the depth of 0-15, 15-30 and 30-45cm from selected 6 AEZs - 1, 3, 5, 9, 11, 13 and 28 (5 samples/spot) using GPS. Soil samples have been analyzed for soil texture, pH, OM, N, P, K & S. Field experimental sites for fertilizer trials have been selected in nine locations using Potato-Boro-T.Aman cropping pattern at Birgonj (Dinajpur, AEZ 1), Debigonj (Panchagarh, AEZ 1) and Pirgonj (Rangpur, AEZ 3); Potato-Groundnut-T.Aman pattern at Kaligonj (Lalmonirha, AEZ 3); Boro-Fallow-T.Aman pattern at Trisal (Mymensingh, AEZ 9) and Shamnagar (Satkhira, AEZ 13); Wheat-Mungbean-T.Aman pattern at Atgharia Pabna, AEZ 11); Mustard-Boro-T.Aman pattern at Madhupur (Tangail, AEZ 28) and Garlic-B.Aman pattern at Baraigram (Natore, AEZ 5). One crop cycle of first year (2011-2012) field experiments was completed. The data of different crop parameters have been collected. Yield of crops, nutrient uptake and economic analysis of first year cropping cycle have done for crops/cropping pattern based fertilizer recommendation for the selected AEZs.The partial economic analysis of first year cropping cycle showed the highest MBCR of 6.11 & 4.44 in T_1 and T_7 treatments at Birgonj (Dinajpur) and Debigonj (Panchagarh), respectively; 4.82 in T_1 at Pirgong (Rangpur); 5.16 in T_4 at Kaligong (Lalmonirhat); 2.93 in T_5 at Trisal (Mymensingh); 1.78 in T_1 at Madhupur (Tangail); 2.89 in T_3 at (Atgharia (Pabna) and 3.81 in T_5 at Shamnagar (Satkhira).

BJRI component: BJRI component conducted four experiments under this project covering eight (8) different AEZ of Bangladesh (AEZ 1, 3, 7, 9, 11, 12, 13 and 19). There were increasing trends of yield with the graded dose of fertilizer over T_1 (100% NPK (STB). The fibre (2.98 t/ha) and stick yield (6.23 t/ha) at Patuakhali and at Comilla fibre (2.97 t/ha) and stick yield (6.51 t/ha) obtained highest with T_6. The treatment T_4(T_1+25%NK yielded maximum fibre(3.85 t/ha),stick(7.80 t/ha) at Kishoreganj and Faridpur(fibre 3.11 t/ha & stick 6.34 t/ha). Rangpur site gave highest fibre (4.65t/ha) and stick (8.30t/ha) yield with T_6 (T_1+25%NPK), Jessore site fibre (3.52t/ha) and stick yield(7.04t/ha) achieved maximum with T_5(T_1 +25%PK). Manikganj yielded highest (fibre 3.90 t/ha and 7.20 t/ha) with T_4 (T1+25%NK). In compare to incremental fertilizer dose (i.e T_2, T3, T4, T5 & T_6) the treatment T_1 (100% NPK (STB) gave lowest yield. Higher rate of BCR observed with the incremental fertilizer treatments over T_1.

BRRI component: BRRI pursued activities aiming to formulate and update fertilizer recommendation for

Rice and rice-based cropping systems under 5 different unfavorable ecosystems unfavorable ecosystem (AEZ-18: Sonagazi, Feni (Saline char area); AEZ-21: Baniachang, Hobigonj (Haor area); AEZ-3: Gongachara, Rangpur (Submergence and Cold area); AEZ-13: Babugonj, Barisal (Tidal Flood Ecosystem) and AEZ-26: Tanore, Rajshahi (Drought prone and Cold area)). The field experiments were conducted in both T. Aman and Boro seasons. A total of 125 composite soil samples (10 samples / spot) were collected from the surface layer (0-20 cm. depth) from five AEZs (3, 13, 18, 21 & 26). Soil samples were collected from 25 farmers' fields at each location. GPS reading and some basic information like village, union, upazila, land type, soil series and land use were collected. Soil samples were analyzed for texture, pH, EC, OC, total N, available P, exchangeable K, available S, available Zn. The nutrient status of soil varied from location to location. From one crop-cycle completion result it may be concluded that the best performance was with T_3 which is T_1-100% NPK (STB) + 25% NP.

SRDI component: Experiments were conducted in five upazilla of Khulna district which are Mosiali of Fultala Upazilla, Teligati of Metro Thana, Gobindakhati and Kapalidanga of Dumuria Upazilla, Jabusha of Rupsha Upazilla and Ghagramari of Batiaghata Upazilla. About 500 soil samples and 250 water samples were collected, analyzed and its result was interpreted. Analyzed result showed that in saline soil the status of N & P was very low to low, K medium to optimum, S & B very high and Zn low to medium. The water salinity data showed that the water safe for irrigation purpose from the month July to December but harmful from February to May. Farmer are recommended to use the river water of January and June after checking its salinity. The cropping pattern of Sesame-Fallow-T. Aman in Kapalidanga of Dumuria, Lady's Finger-Fallow-T.Aman and Sweetgourd-Fallow-T.Aman cropping pattern in Batiaghata were completed. For single crop experiment of Spinach at Metro, Indian spinach, Bitter gourd and water melon at Batiaghata were completed. Fertilizer application had significant positive effect on all cases in irrespective of crops and soils. Treatment T6(STB rate+25% additional NPKZn) produced the height response followed by T3(STB+25% NP) and T4(STB+25% NK).

BSRI Component: To ascertain the fertilizers requirement of sugarcane intercropped with potato, onion/garlic; three sets of experiments were conducted at different locations under AEZs 3, 8 and 11. The work was ongoing during the reporting period.

BAU Component: Delineation of micronutrients status in soils from different AEZs, requirement of micronutrients for crops and comparison of foliar spray with soil application for micronutrients are going on.

Coordinated sub-project on Characterization of Important Plant Genetic Resources

BINA Component: A total of 67 rice, 17 mustard, 8 sesame, 14 soybean, 14 groundnut, 33 mungbean, 16 chickpea, 1 blackgram, 1 grasspea, 17 tomato, 8 jute and 28 lentil genotypes were characterized morphologically. Characterization of selected GI crops (Blackgram: Kali kolai, Sesame:Local til and Mungbean: Sonamug) have been done morpho-logically. DNA fingerprinting of 57 rice, 15 mustard, 4 sesame, 4 chickpea, 22 lentil genotypes and blackgram (GI), sesame (GI) have been done using SSR/RAPD markers. There were wide variation (green, purple, greenish purple) in colour of leaf blade joint, petiole and basal petioles among the AVRDC, advanced lines and varieties of mungbean genotypes. Low anthocyanin colour was observed in all the tested chickpea varieties except Binasola-4. Mutant variety, Binasola-5 possesses distinct green seed and seed coat colour while other varieties/genotypes showed light brown to dark brown colour. Wide variation was observed in different crops in respect of leaf size, colour, days to maturity, number of pods, pod length, seed yield etc. Genetic variation was also observed within rice, chickpea, mustard, lentil and sesame germplasm.

BSRI Component: Fifty germplasm were planted in the field for morpho-molecular characterization as per schedule of DPP. Data were taken at 7-8 months and at 10-12months after planting. Morphological data on eighteen (Plant height, Dewlap pattern, Pattern of bud, Pattern of auricle, Internodes length and diameter, Brix etc.) main characters including 53 parameters and photographs have been taken for all the accession. DNA isolation has also been done. Molecular characterization has been done for 27 accession.

BJRI Component: Geographical Indication (GI) materials, released/registered varieties of jute, kenafand mesta and germplasm of deshi jute *(C.capsularies)* and tossa jute *(C.olitorius)* were the experimental materials. Four GI materials have been collected from Kishorgonj and Tangail regions and these were Suti pat and Ashman Tara of deshi jute, Deo Nailla of tossa jute and Bot Nailla of kenaf. During the project period 4 GI materials of deshi & tossa jute, 12 released varieties of deshi jute, 9

varieties of tossa jute, 3 varieties of kenaf, 2 varieties of mesta, 48 germplasm of deshi jute and 47 germplasm of tossa jute were characterized as per descriptor of SCA. Clear variation was observed in the GI materials in respect of leaf shape, petiole colour, 100 seed wt., and flowering time. The released varieties of deshi and tossa jute have clear distinctness among themselves in respect of leaf shape, petiole colour, 100 seed wt., and flowering time. Germplasm materials of deshi and tossa jute were also distinct from each other in respect of pigmentation, leaf size, petiole colour, flowering time, fruit size and shape.

BARI Component: Morphological characteri zation data of 42 genotypes (11 mango, 7 litchi, 3 banana, 8 lime, lemon, citron, 2 burmese grape, 3 golden apple, 5 bel, 2 wild orange) out of 67 genotypes of BARI mandated crops have been recorded as per IPGRI descriptors for individual crops. The photographs of the specific trait considered to be helpful for identification of the variety were taken from each genotype at appropriate time for traits to compare the distinctness among the cultivars of the respective crops. Wide variations were recorded among the GIs and released varieties of each crop in respect of plant, leaf, flower/inflorescence, fruit & seed characters, and incidence of biotic and abiotic stresses. Each genotype posses some unique characters, which distinguish it from all other genotypes of the respective crop. Some of the crops like Citron (Jara lemon, wild orange/satkara) have been found in wild state indicating that those ares are the center of origin or secondary center of diversity of these species. Molecular characterization could be done only in mungbean and the data indicated that there is narrow genetic base among the varieties.

BAU Component: Morphological and molecular characterization 8 GI crops and some BAU released varieties have been completed. DNA extraction of some GI and BAU released varieties has been done.Overall results showed wide variation at both morphological and molecular level.

BRRI Component: Morphological characteri zation of 20 Gi rice, 48 land races of Aus, and 98 landraces of Aman has been completed and characterization for 98 landraces of Boro are on-going. GI rice has been characterized at molecular level using14 markers and 6 primars found to be polymorphic. 48 Aus rice have been characterized at molecular level using 30 makers and 14 primers found to be polymorphic Gel documentation of 98 landraces of Aman is going on.

CDB Component: Morphological characterization of over hundred genoitypes have been done.

Co-ordinated Sub-project on Arsenic in Soil-Water-Plant System

BARI: A total of 720 soil, 208 water, 360 rice (grain and straw) samples were collected. Among the collected samples, 440 soil, 108 water and 160 rice samples have been analyzed for As content. Screening of wheat varieties was done against As contamination in badly affected Faridpur (Poranpur) and Jessore (Chowgacha and Sharsha) regions where Satabdi yielded slightly higher followed by Prodip than other varieties. But As content and uptake in grain and straw was found lower in Prodip. The performance of organic amendments in mitigating As contamination in soil and stem amaranth through pot trial was conducted. Plant population in contaminated pots reduced appreciably with the increase in As level. A total of 59 winter vegetable samples from 17 types vegetables and 53 samples from 11 types vegetables were collected from Jessore and Chapai Nawabgonj, respectively to observe the uptake pattern of As in vegetables grown in contaminated areas. Among the tested samples, aroid leaves contained higher As followed by Indian spinach, amaranth, cabbage and coriander leaf. Thirty weed samples (taking 15 from each location) were collected from highly arsenic contaminated Faridpur and non-contaminated Gazipur area for the characterization of phytoremediants to develop phytoremediation technique.

BRRI: Ground water survey along with soil and rice plant sample collection was conducted in four different upazilas of the country. Besides, planned field experiments were conducted in As-contaminated sites to reduce As toxicity in crops and soils. Five unions namely Korola, Keragachi, Jalalabad, Jugikhali and Helatala of Kolaroa upazilla contained high soil and water arsenic. Similarly high soil and water arsenic was found in three unions (Alibabad, Koijuri and Machchar) of Faridpur sadar upazilla. So, high arsenic containing unions under these two upazillas may be considered as arsenic hot spot area. Among nine Boro varieties, BRRIdhan47 and BRRIdhan50 showed less As uptake. In water management technieqes continuous standing water (CSW) condition with As containing ground water apparently showed little bit higher As content in straw and paddy than surface water irrigation irrespective of alternate wetting and drying (AWD) and CSW. As uptake by rice plant was little bit lower from soil treated with sugarcane leaf or ash @ 2 t/ha

along with recommended fertilizer than treated with recommended fertilizer.

SRDI: A total of 240 soil, 240 water samples as well as 300 rice grain samples from Chandina, Kochua and Veramara. Rice samples have been collected in both Boro and Aman season. The samples of soil, water and grain have been analyzed by ICP flowing world wide standard method. The findings of the study show that most of the soils of project area contain less than 20 ppm arsenic. The highest concentration of arsenic (25.96 ppm) has been found in Boro Koraia union of Kochua Upazila under Chandpur District. The water samples from different locations of the study area contain 0 to 0.80 ppm arsenic Findings of the study show that irrigation water of STW contains more arsenic irrigation water of DTW.

Performance of wheat varieties to arsenic contaminated soil and irrigation water at Jessore

Coordinated sub-project on addressing climate change on fisheries sector through community based technology identification and adoption in the fragile aqua ecosystems of Bangladesh

During the period a total of 636 farmers were engaged and nine trials on different technologies were conducted. Out of them Cage aquaculture-108, Tilapia hapa breeding-46, Chital & vetki culture-25, Crab fattening-25, Rice-fish-10, Over-wintering of fingerlings-35, Koi-shingi culture-25, Fish sanctuary-158 Community based fisheries management-204 farmers were engaged. Among the technology options tilapia hapa breeding, crab fattening, chital and vetki culture, community based fisheries management. Fish sanctuary and over-wintering of fingerlings were found very suitable to address the adverse impact of climate change in fisheries sector. Farmers achieved high profit margin from crab fattening and tilapia hapa breeding. The cost- benefit ratio was about 1:2. Farmers harvested more than 20 MTs of fishes from a beel through community based fisheries management. Besides, after harvesting of fishes they have cultivated winter vegetable and wheat and the production was excellent. Cage aquaculture of tilapia showed excellent results and more farmers are ready to take up the technology. Huge number of indigenous fishes gathered in the fish sanctuary and many of them have already started breeding.

Training of the Fish Farmers

Co-ordinated sub-project on the Surveillance of Important Infectious, Zoonotic and Emerging Diseases of Livestock and Poultry in Bangladesh

CVASU Component: ELISA protocols for ILT and IB and PCR/RT-PCR protocols for Rabies, IB, LL, ILT and MS have been standardized. Multiplex RT-PCR protocol for respiratory viral diseases of poultry (ND, ILT, IB and AI) has been established. GIS mapping for occurrence of ILT in some selected Upazilas of Chittagong District has been completed. Rabies has been detected in Wildebeast (one type of wild animal) for the first time in Bangladesh using Rapid immunochromatographic test (BioNote® Rabies detection kit). RT-PCR based protocol optimized using Nested RT-PCR for Rabies virus (N gene) from clinical samples (both from ante mortem & postmortem cases).PCR based protocol optimized for Avian Leukosis virus and its subgroups, and for Infectious laryngotracheitis virus (ICP4 gene).RT-PCR based detection protocol optimized for Infectious bronchitis virus and detection protocol for *Mycoplasma synoviae* has been optimized.Multiplex RT-PCR for respiratory viral infections such as avian influenza (AI), Newcastle disease (ND) Infectious bronchitis (IB) and Infectious laryngotracheitis (ILT) have been established.

BAU Component: Molecular diagnostic test protocols like ELISA, PCR, RT-PCR, Immunohistochemistry, Slide Agglutination test, Tuberculin test, bacteriological test protocols were adopt to identify FMD, Tuberculosis, Leishmaniasis, Duck Plague, Avian Influenza, Duck Anatipestifar, Marek's disease, Anthrax, babesiosis, Anaplasmosis, Thileriosis etc.GPS based data was collected in relation to diseases and mapping and distribution

plotting are in progress. Accurately identified selective disease with their etiology, determinants and locations and provide suggestions to prevent their dessimination and management. Detailed data on to the occurance, seasonality, host distribution, strain/serotype/species of organism of FMD, TB and Leishmania involved were generated which will help formulating future control program against these diseases.

Coordinated sub-Project on Farming Systems Research and Development for Farmers' Livelihood Improvement

BARI Component: Development of alternate cropping pattern Radish-Potato/Maize-T.aman rice against Potato/ Maize-T.aman rice cropping pattern and Mustard-Boro -T.aman rice against Fallow-Boro-T.aman rice, alternate cropping pattern Potato/Sugarcane-Leafy Vegetables against sole Sugarcane cropping patter at northern region of Bangladesh. Improvement of cropping pattern Wheat-Jute-T.aman, Mustard-Boro-T.aman, Lentil-Jute-T.Aman, Cabbage-Sesame-T.Aman, Mustard–Boro-T. aman against Fallow-Boro-T.aman, Radish-Potato/Maize-T.aman rice against otato/ Maize-T.aman rice, Mustard–Boro-T. aman against Fallow-Boro-T.aman cropping pattern at northern region of Bangladesh. Production program of BARI Sarisha 14, BARI released Pointed gourd varieties, wheat (variety BARI Gom 24), mungbean (variety BARI mung 6), Sesame (variety BARI Sesame 4), BARI Masur 6, BARI Masur 6, BARI panikachu 1 and BARI panikachu 2, BARI released Onion Variety (BARI Peaj 1) - i) bulb & ii) Seed production have been completed successfully. Mixed culture of *Rajpunti*, Grasscarp and Mirrorcarp in seasonal mini pond. Poly culture (carp) techniques in perennial ponds under low cost management Vaccination to poultry bird (BCRDV, RDV, Gumbora, Fowlpox), Goose and pigeon rearing under farmers condition in HBT,De-warming of cattle, Beef fattening with UMS diet,Vaccination to cattle (Anthrax, HS, BQ, FMD) and rearing of sonali chicken under village condition.

Mixed cropping at Ishurdi, Pabna

BRRI Component: N-management through use of LCC in modern Boro and T. Aman rices, Production highvalue summer and winter vegetables, creeper vegetables roof top. Management of existing fruit trees, improved variety of Mango and coconut, really cropping of grass pea with T.Aman in-Fallow-T.Aman cropping pattern, intercropping banana with sweet gourd increase system productivity of fruit/vegetable in fallow-T.Aus-T.aman and pilot production of aromatic rice (BRRIdhan34 and BRRIdhan50) in T.Aman and Boro have been executed. Vaccination of poultry birds and cattle, rearing of layer and pigon, duck rearing, Poly culture of fish in seasonal pond and integrated rice-fish culture in T.Aman have been done.In pilot production program yield of aeromatic rice was satisfactory and farmers showed kneen interest to adopt this variety, yield of existing fruit trees increased significantly through use of improved management practices, mortality rate has been reduced and cattle health improved, fish yield and consumption of fish by the farm family increased and Rice + fish system has given 18% higher rice equivalent yield (REY) than single rice system

BINA Component: Results of cropping pattern experiments revealed that an average yield 4.5 t/ha, 1.67 ton/ha, 16.54 and 5.4 ton/ha of grain were obtained in T.aman (var Binadhan-7.), Mustard(BinaSharisha-4),Potato(Cardinal) and Boro(BRRIdhan29) season respectively. Farmers pattern was: T.aman-Fallow-Boro and imposed pattern was: T.aman (Binadhan-7)-Mustard (Binasarisha-4)/Potato (Cardinal and challisha)–Boro (BRRIdhan29). Bottle gourd, Country bean, amaranth and sweet gourd yields were 9.95 ton/ha, 7.97 ton/ha, 82 ton/ha and 53 ton/ha respectively. On an average weights of rui, silver carp, sarpunti, mrigel and grass carp were 550gm, 700gm, 300gm, 600gm and 750gm respectively. On an average weight of mono sex tilapia was 190gm. per family Tk 6000 to Tk 7000 of income achieved by duck rearing. Per family income was Tk 500 to Tk 700 achieved by pigeon rearing. Mortality rate of the cattle in the vaccinated area reduced significantly. Health status of the cattle increased significantly due to de-worming practices. Bottle gourd, Country bean, amaranth and sweet gourd yields were 9.95 ton/ha, 7.97 ton/ha, 82 ton/ha and 53 ton/ha, respectively. Cucumber, sponge gourd, pointed gourd, ladies finger, cucumber, and ash gourd have already harvested and data are under process. Mango (Amropoly), year-round lemon, tezpata and mehogony saplings were planted among the farmers.

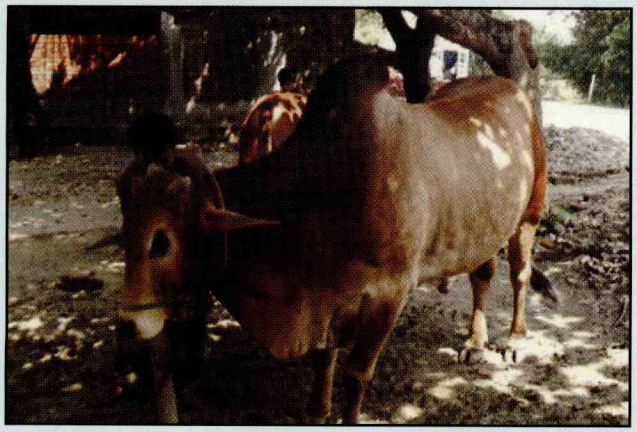
BFRI (Fisheries) component: Fingerlings of shing with magur, GIFT and silver barb were stocked in

ponds at a stocking density of 125,000, 25,000, 25,000 and 12500/ha. After six months rearing, the average production of shing with magur, GIFT and Silver barb were 8670 kg/ha. The harvesting weight of Shing, Magur, Monosex Tilapia and Silver barb were 35±4.25, 200±10.21, 260±6.22 and 142±7.21g. Overwintered fingerlings of rui, catla, mrigal and grass carp were stocked at the rate of 6000/ha during March 2013. Fish were fed with supplementary feed containing 28% crude protein at the rate of 3-6% of estimated biomass. After seven months rearing, over wintered fingerlings performed remarkable growth and the production was 8183 kg/ha. Monosex fingerlings of GIFT were stocked in pond during August 2012 at the rate of 62,500/ha. The initial weight of fingerling was 8.53±0.74g. Supplementary feed (28% crude protein) were supplied to the fishes at the rate of 6-10% of estimated body weight. The average production of monosex tilapia was 11375 kg/ha/4 months. Fingerlings of shing with magur, GIFT and silver barb were stocked in ponds at a stocking density of 125,000, 25,000, 25,000 and 12500/ha. After six months rearing, the average production of shing with magur, GIFT and Silver barb were 8670 kg/ha. Total production of vegetables was 5622 kg/farmer. Production and daily intake of vegetable were increased by 64.42% and 62.5% respectively. Net income was Tk. 10,500/farmer.The body weight gain of treated cattle was 18 kg more than controlled cattle.The mortality rate after vaccination was 2.6% and milk production was increased upto 33%The average growth increased after vaccination of cattle, goat, and duck was 18%, 2%, 16% respectivel.The average egg production was338/month/family.The average income was Tk. 2365/month/family.The body weight gain of treated cattle was 18 kg more than controlled cattle. Average production of HYV cucumber was 2.5 ton/10 decimal. Average production of papaya was 400 kg/month/farmer. Family income increased and average income/month/farmer was Tk. 6000.The average egg production was338/month/family. The average income was Tk. 2365/month/family. The body weight gain of treated cattle was 18 kg more than controlled cattle. The squab egg production was 6 Pair/ year with the average income from squab was Tk. 1040/ 7 months/family.

BSRI Component: Replacement of existing sugarcane varieties by newly developed varieties (Isd 16, Isd 35, Isd 37 & Isd 39), comparative performance of different planting materials of sugarcane, performance of different vegetables-mungbean sequential intercropping with paired row sugarcane, productivity of some selected crops as intercrop with single row sugarcane, clean seed (Certified) production of newly released sugarcane varieties (Isd 38 & Isd 39) using STP and year round homestead vegetable gardening at FSRD Project site were the implemented program of BSRI. 300 cattle were vaccinated (Anthrax + HS + BQ vaccine) where proper vaccination and rearing procedure given to the farmer showed less mortality (76%) of their livestock population and improved health condition. 300 poultry were vaccinated (BCRDV+RDV+Fowl Pox+Fowl cholera) where the mortality rate reduced about 92 percent. 119 cattle were dewormed, 6 selected cattle were injected with vitamin ADE along with deworming and other 12 cattle were taken into UMS and vitamin injected group where as 6 cattle were untreated as control. Result showed that 38.72% body weight increase and 94.94% value increment whereas only UMS feeding dewormed cattle (6) showed 31.27% body weight increase and 71.61% value increment which assumed comparatively lower in performance. Supplying quail springs to the farmers showed good result and Initial average weight of quail was recorded as 55 g which was increased to 135 g and gross margin was calculated as Tk. 1070 per farmer after 3 months of rearing. Fish fry were released, supplementary feeds and fertilizers are supplying at regular interval. Average pond size was 20 decimal where production was 5360kg/ha and BCR was 3.19.

BJRI Component: Jute seed productions with winter vegetables were compatible and profitable. Gross margin return was increased by 95.59% over sole jute seed production. Yield of jute was increased by 20% and income thereby increased 32% adopting BJRI developed tossa jute variety O-795 over local variety. The introduction of BARI Moshur -6 increased the lentil production 54.31% and gross return by 53.63%. Yield and income of the BARI -15 mustard variety was increased by 56.51% and Tk.31198/- per hectare, respectively.. Homestead vegetables production was increased by 136 % and vegetables consumption was increased by 148 % following BARI developed model Narikeli at Kishoreganj in Kharif-1 season with modern vegetables varieties. BARI Sharisha-15, Jute seed production with winter vegetables, BARI-Begun (Summer)-10, BARI Bean (Summer)-7 and Olitorius jute O-795 performed well. Farmers are interested in adopting and producing these varieties at their fields. Narikeli model for homestead gardening at Kishoreganj was highly acceptable by the farmers of the locality. Poultry, duck and goat rearing in farmers household increased farmers' income as well increased protein intake like egg consumption. Fish production like cultivation of Gift Tilapia was more profitable both Manikganj and Kishoreganj. In six months period gross margin was 127200/- and 119500/- at Manikganj and Kishoreganj investing 138800/- and 137000/- respectively.

BLRI Component: Application of improved beef fattening model developed by BLRI increased growth rate and feed conversion efficiency of fattened cattle significantly ($P<0.001$) over the traditional farmer's practice at Bhagabari of Sirajganj district. Net return was also significantly higher (Tk. 14500 against Tk. 6300 per animal). Significant reduction in mortality was observed in the sites due to routine and mass vaccination of all cattle, goat, sheep, chicken and duck of all households, use of required anthelmintics, farmer's awareness for good feeding and health management both at Garadah of Sirajganj and Naikhongchari of Banderban districts.



A fattened animal fed withUrea-Mollases-Straw Diet at Garadah, Sirajganj

BFRI Component: Activities like, bamboo propagation and grove management technique; introduction of multipurpose tree species as homestead agro forestry component and their management; vegetable and fruit cultivation in homestead; vaccination and de-worming of poultry, cattle, and goat in the whole village; rearing of chicken and goat in the farmers household; cultivation of betel nut tree around the agricultural land; distribution of improved "pucca chula" among the women farmers; and introduction of bee culture practice to the hill farmer have been under taken and are being implemented from March 2013. So, results are yet to be achieved.

Policy level contribution

Under the SPGR, one sub-project on 'Consequences of tobacco cultivation in Bangladesh' has generated some preliminary information on the economy, health hazards and alternate profitable cropping. Once the sub-project is completed, these recommendations will be taken as a matter of implementing these for actions.

Research/Financial Management and Coordination

The PIU-BARC was actively involved in development, implementation, coordination, and monitoring, and reporting of the Sponsored Public Goods Research sub-projects during 2012-13. The key financial management activities of PIU-BARC are maintenance of books and accounts, budgeting, banking operation, fund inflow. Total allocation during 2012-13 was 35.00 crore and expenditure was 31.75 crore, 90.70 % of the allocation.

RADP allocation and financial progress during 2012—2013

Code	A. Revenue Component	RADP Allocation			Expenditure		
		RPA	GOB	Total	RPA	GOB	Total
4500	Salary of Officers						
4600	Pay of establishment	20.64	0.86	21.50	20.33	0.85	21.18 (98.51)
4700	Allowances	3.36	0.14	3.50	3.25	0.14	3.39 (96.86)
4800	Supply & Services	2657.00	0.93	2750.00	2565.17	92.29	2657.46 (96.34)
4900	Repair and maintenance	96.00	4.00	100.00	27.42	1.14	28.56 (28.56)
Sub Total A:		2777.00	98.00	2875.00	2616.17	94.42	2710.59 (94.28)
B. Capital Component							
6800	Asset acquisition	483.00	22.00	505.00	354.99	16.78	371.77 (73.62)
7000	Construction & civil work						
7900	CD VAT		120.00	120.00		92.25	92.25 (76.88)
	Sub-Total B:	483.00	142.00	625.00	354.99	92.25	464.02 (74.24)
Grant Total: (A+B)		3260.00	240.00	3500.00	203.45	2971.16	3174.61 (90.70)

Figures in parenthesis are the expenditures over RADP in %

Financial Management for SPGR Sub-projects: Statement of Expenditure (SoE) along with bank statement and bank reconciliation are submitted by the PIs counter signed by appropriate authority of the respective institution on a monthly basis. Transfer of funds to the bank account of SPGR sub-project is done on the basis of recommendation made by technical divisions of BARC and approval of Executive Council of BARC.Total fund approved for the implemented 108 SPGR was appx. Tk. 79.39 crores and Tk. 65.51 crores has been released till June 30, 2013.

Financial Monitoring: PIU consolidate and review of all financial reports such as SoE, Bank Reconciliation Statement etc. from the spending units as a part of desk monitoring. Monitoring and supervision in the way of field visit of important cost centers is also done for bringing better financial discipline, accountability and transparency in the SPGR sub-projects and EIRE activities.

Financial Reporting: The PIU-BARC is regularly preparing and submitting financial & other progress reports to the relevant authorities such as PCU, BARC, IMED, MoA, CAO/MoA, IDA, IFAD and other stakeholders as required. Besides, preparation of Annual Financial Statement (AFS) with notes to the AFS & QFMR and submission to Foreign Aided Project Audit Directorates (FAPAD) and World Bank is also done regularly.

Training on Financial Management: Finance unit of PIU-BARC organized training on "Financial Management & Procurement for SPGR Sub-project" with the view to establish proper financial management procedure in all SPGR sub-projects as well as bringing financial discipline, capacity and skills development of the personnel in NARS institutions.

Procurement: The fund allocation and expenditure for procurement is shown in Table 2. As per plan, there was a total of 39 packages for procurement of which 13 (33%) was completed and the rest were in process. Among the target packages, there was 26 for goods, 5 for works and 8 for services. Out of these 10 (38%), 1 (20%) and 2 (25%) packages for goods, works and services respectively were completed Strengthening laboratory facilities for agricultural research in the country, provision of specialized equipment including replacement/addition of minor ones have been made in the RDPP of PIU-BARC and in individual SPGRs. Most of these equipment have been procured and are being used by the respective institutes.

Allocation and expenditure for procurement

RADP Allocation					Expenditure (Achievement in %)			
	Goods	Works	Services	Total	Goods	Works	Services	Total
GOB	143.00	2.85	6.06	**151.91**	109.03	0.81	6.04	**115.88**
RPA	493.00	67.15	172.94	**733.09**	356.04	19.53	170.44	**546.01**
Total	**636.00**	**70.00**	**179.00**	**885.00**	**465.07 (73%)**	**20.34 (29%)**	**176.48 (99%)**	**661.89 (74.79%)**

Package wise target and achievement of procurement 2012-2013

No. of packages											
Goods			Works			Services			Total		
Target (No.)	Achievement (No.)	Achievement (%)	Target (No.)	Achievement (No.)	Achievement (%)	Target (No.)	Achievement (No.)	Achievement (%)	Target (No.)	Achievement (No.)	Achievement (%)
26	10	38	05	01	20	08	02	25	39	13	33

6. Monitoring and Evaluation

Monitoring of the research is done with constant interaction and awareness building, the number of visits, effectivity and reporting quality have much improved over the time. As a matter of regular practice, there were continuous desk monitoring of the SPGR and ERIE activities since inception to date.

Monitoring of the SPGR from six different ends

Organization	Activity type	Remarks
BARC Technical Divisions	Field monitoring	Done as a part of their mandatory responsibility and since they coordinate the researches undertaken. Until date, several number of visits made by them.
PIU-BARC	Desk and field monitoring	As a part of their regular activity perform tracking of the implementation activities. Interventions done on the spot during field visit and through different means of communications. Required actions are taken to overcome if anything happens otherwise.
Local level Monitoring by the implementers	Field monitoring	Monitoring at the ground level is the most effective one. M&E cells at the ARIs and the Universities have been observed to be more and more active now. Both the number of visits and the quality have improved.
Central monitoring by the joint BARC team	Field monitoring	Organized by the P&E division of BARC in association with the PIU-BARC and implemented by forming 3-4 membered multi-disciplinary team with the provision to induct one member from the ARI/Universities M&E cell. Planned once per crop season or as needed. Findings already shared in three communication workshops organized in this respect; attended by both who monitored and whom were monitored.
Concurrent monitoring and evaluation by the PCU hired firm	Field monitoring	This is being done for the last nearly two years and reported back. Actions are taken accordingly.
World Bank-IFAD's ISM/MTR Missions	Review and Field monitoring	By now 10 such events happened. Comments/observations are given on the spot and are briefly reflected in the Aid memoire of the mission. Actions followed as per given suggestions.

In addition, several review meetings and discussion forums on SPGR were organized by the concerned technical divisions and the PIU-BARC. All required assistance by the PIU-BARC provided to the PCU appointed firm on concurrent monitoring and evaluation, and impact assessment (IA). Numbers of monitoring done, key monitoring activity and output/outcome and the result based M&E along with outcome indicators are presented in Tables 5-6.

Number of monitoring performed/reported

Sl. No.	Name of the Organization	No. of SPGR Sub-projects Monitoring Performed			
		2010	2011	2012	2013
1	BARC: a) Central	-	33	56	116
	b) Technical Divisions	14	38	64	47
2	PCU/ Hired Firm	-	19	45	33
3	WB-IFAD Missions	-	2	2	*
4	Local level Field Monitoring by the ARIs/Universities	-	32	48	110
5	PIU-BARC: a) Desk Monitoring b) Field Monitoring	40	65	90	108
		20	26	37	51

***Covered over 30 SPGRs**

Monitoring interventions, outcome and current status

Sl. No.	Intervention/Activity/Observation	Outcome	Current Status
1	Delay in procurement of materials and services by the grant recipients.	In several cases, delay in material and service acquisition resulted negatively on the output and resource utilization.	Intervention from the PIU-BARC accelerated the procurement process.
2	Strengthening of the local level monitoring for better implementation of research.	M&E cells at the NARS level have been expanded and stands at 13.	Monitoring process enhanced and now more active. However, institutionalization and formalization of these cells requires urgent attention.
3	Irregularity in reporting and submission of the PCR from the implementers.	Non-submission of reports in time causes delay in compilation and further actions.	Much improvement occurred due to interventions and the situation has much improved.
4	Documentation and dissemination of research results.	Due to interventions and pursuance by now 42 journal articles, 84 technical bulletins, 14 training manuals, and 61 and 89 materials respectively for printing and electronic media have been prepared and disseminated.	Further activities are on.
5	Resource utilization and execution of all objective oriented activities within the timeframe.	Resource utilization and undertaking of planned activities within budgetary provision are indispensable and that needs to be reported.	Discussed with the PIs and relevant officials on this particular issue and most of them observed to be more particular and serious.
6	Disruption in funding.	Disruption in funding twice in 2012 and once in 2013 caused much problem in timely execution of some SPGRs' activities.	All parties to be much more vigilant in the coming days in order to avoid such incidence.
7	Further strengthening of local level monitoring by M&E cells of the ARIs and Universities.	Since last 10th mission in total 48 SPGRs visited by the ARI's M&E cells members and the University designated personnel. The cumulative visits are till to-date stands at 190.	Institutional M&E cells are now better functional.
8	Social and Environmental safeguard	PIU-BARC organized a workshop in 2012 and one by PCU; in addition to the review workshops, help in creating greater awareness of the implementers in the aspect of impact.	In the PCR, reporting on these aspects being done.
9	Monitoring of the changes in the environmental parameters	Due to awareness building, no adverse effects were created on the environmental parameters.	These are being well taken care of.
10	Field monitoring by the joint team of BARC	There were in total visits of 55 SPGR sub projects in addition to earlier 61 visits by the central monitoring teams in 2013. Issues raised were discussed and remedy suggested.	Coordinators/PIs are requested to undertake the necessary actions.
11	Monitoring by the PIU-BARC	Desk monitoring of all the 108 SPGR sub projects are being done at regular basis. PIU-BARC team members visited 33 SPGRs after the last mission besides the earlier 18 in 2013 and having several review meetings at the ARI level.	Periodic monitoring and review of implementation progress are found to be improved the research quality.
12	Monitoring by the PCU's concurrent monitoring and evaluation team.	PCU hired consulting firm BETS's team visited 15 SPGR subprojects during the reporting period in addition to 18 in 2013 and 45 in 2012.	Observations communicated to the concerned PIs.
13	Workshop for sharing of the field monitoring findings.	A workshop was organized on 20 May 2013 by the P&E division, BARC in association with the PIU-BARC and two such workshops were arranged in 2011 and 2012. There were open discussions after presentation of the monitoring reports by each individual visiting team of BARC.	Published proceedings and shared with the implementers informing the actual status and taking necessary measures, where applicable.
14	Skill development in procurement and financial management	The shortage of skilled manpower is a limiting factor in the whole NARS. As such several trainings imparted and in total 660 persons were trained.	Much improvement occurred and is reflected through procurement performance impact

For the third time, Planning and Evaluation division in association with the PIU-BARC arranged central monitoring by forming 10 teams drawing multi-disciplinary scientists from different divisions with a provision of inducting one member from the visiting organization's M&E Cell. Two day-long workshops on 'Monitoring and Evaluation Activities in the NARS' were organized by the Planning and Evaluation Division in collaboration with the PIU-BARC on 27 Nov 2012 and 20 May 2013 respectively at BARC to to formulate suggestion in strengthening the M&E activities at the NARS and to work further on the way to institutionalize the M&E system within the NARS.The M&E Cells of the NARS presented their monitoring activities covering both technical and financial aspects.

Human Resource Development (HRD): In compliance of the RDPP provision, 30 international PhD scholarships were awarded in various fields of agriculture. One PhD scholar died in June, 2012 while pursuing study in abroad. During the reporting period, two PhD scholars have obtained their degree within stipulated period of 36 months. All other PhD scholars requested for extension of scholarship period beyond 36 months and BARC allowed 6 months extension i.e. a period of 42 months to complete their degrees. As per progress trend, all the PhD scholars should be able to complete their program within specified time.

There were award of 10 international post-doctoral fellowships. In the mean time 5 post doctoral fellows completed their program, returned. Two post doctoral fellows are pursuing their program in USA and two other candidates got admitted and awaiting for Govt. clearance. The remaining one is under process of admission.

As regard 60 national PhD scholarships in various fields of agriculture, 6 scholars have already secured their PhD degree by now and other 7 have submitted their thesis to respective universities for defense. Eleven PhD candidates have prepared final draft of their thesis and the rest completed the 1st draft. Nineteen researchers have been pursuing PhD degree under the SPGR subprojects and they have completed the courses and field experiments in different national universities.

By now, a good number of scientists, extension workers, technicians and farmers have been trained within the country in the identified skill gap areas of M&E, financial management, procurement, project development and production techniques, etc. Besides, many scientists attended in foreign short term trainings, study visits and participated in seminars/workshops. Definitely, once the scientists completed their higher studies and joined the pool of the NARS, it will create a great impetus and would assist to address emerging and priority issues in the coming days.

Human Resource Development progress

Sl. No	Activities	Achievement/Outcome		Remarks/Outcome/Impact
		2012 to 2013	Cumulative since inception to June 2013	
1.	Foreign PhD program (on-going)	29	29	30 scientists were sent for oversees PhD. One PhD scholar died in June 2012. Remaining 29 PhD scholars have already completed their courses and now they are preparing their thesis. It may be noted here that during the reporting period two PhD scholars have been awarded PhD degrees within 36 months.
2.	Foreign Post Doctoral (on-going)	3	7	Five Post Doctoral scholars already completed, returned and joined their respective positions. Two Post Doctoral scholars are pursuing their program in USA. Two Post Doctoral scholars' government order is under process. Rest 1 post doctoral is under process for admission.
3.	Foreign Short term Training	60	164	During the reporting period 60 scientists were attended oversees short term training and total oversees participants were 164. All participants returned back and joined their respective

Sl. No	Activities	Achievement/Outcome		Remarks/Outcome/Impact
		2012 to 2013	Cumulative since inception to June 2013	
				positions in their respective institutions.
4.	Foreign Study Visit	46	66	In the period 46 NARS scientists participated in study visits abroad. The total oversees study visit participants were 66 and all were returned back and joined their respective positions.
5.	Foreign Seminar/ Workshop	13	70	13 NARS scientists attended oversees Seminar/workshop/ conference during the reporting period i.e. in total 70 scientists were participated. All participants returned back and joined their respective positions.
6.	In-Country PhD program (on-going)	79 (60+19)	79 (60+19)	60 PhD scholars already completed courses and research work. During this period 06 scholars have been awarded PhD degrees, 07 scholars submitted their thesis, 11 have been completed their final thesis drafts. In case of 19 PhDs under SPGR sub projects, they also have completed courses and field experiments in different public universities.
7.	Local Short term Training	16 Courses (1947 persons)	116 Courses (4129 persons)	In the period 16 training courses with 45 batches and attended 1947 NARS scientists/officials. The total participants were 4129 and now they are working in their respective positions.
8.	Local Seminar/Workshop	13 Events (752 persons)	77 Events (6156 persons)	During the reporting period organized 13 events of national seminars/workshops in various fields of agriculture with attended 752 NARS scientists/officials. In all 77 national seminars/workshops attended participants were 6156 and they are working in their respective positions.
9.	Hiring HRD consultant (International)		3 (Three) months	A mission-oriented framework for HRDM in NARS Training system for NAR and center for research management at BARC. Selection of training modules for NARS and policy recommendations on HRDM in NARS
10.	Hiring HRD Consultant (National)		3 (Three) months	Development of need-based and future-focused human resource management plan for effective and output oriented NARS.

Side by side of HRD, building of some laboratory facilities and arrangement for supply of some specialized equipment is assisting in creation of an enabling environment for advanced studies. The status of procurement of the equipment under SPGR as obtained from the implementing agencies is provided in Table-6. All these are significant towards the capacity enhancement of the NARS, but much more need to be done in future including some land development work and physical facilities especially in the outreach research stations of the ARIs.

Generation of Transferable technology: So far, seven SPGR sub-projects have been completed. Draft project completion reports have also been submitted by the respective PIs for evaluation by the concern authority. Some promising and fruitful technologies/ information have been generated through these completed sub-projects which are summarized and presented below:

Features and status of technologies generated by 7 completed sub projects

Sl. No.	Title of Completed Project	Date of Completion	New Technology/ Knowledge Generated	Salient Features of Technology	Technology Dissemination/Utilization Status
1	Development of salt tolerant rice varieties through induced mutation and marker-assisted selection	June, 2013	A salt tolerant rice variety Binadhan-10.	Salt tolerant upto 12 dS/m; High yield (5-6 t/ha), short duration (127-132 days); Suitable for coastal area during Rabi & Kharif-II season.	Released by the National Seed Board, Limited dissemination and seed multiplication program undertaken.
2	Assessment of Post-harvest Losses and Improvement of Post-harvest Practices of Major Fruits and Vegetables of Bangladesh	June, 2013	Identified key areas of post harvest losses of selected fruits (mango, jackfruit and papaya) and vegetables (tomato, brinjal, cabbage and cucumber) and determined losses	Prepared jackfruit chips and vinegar pickling of cucumber and found good for consumption, storage life up to 4 months	Workshop organized and draft on post harvest management guide prepared. Some dissemination material prepared and distributed.
3	Integrated Crop Management for the Improvement of Jackfruit	Februar y, 2013	Identification of major disease and pest. Improved Management Technique of Jackfruit developed.	Bordeaux paste/ Coal tar treatment for gummosis of jackfruit found effective in controlling gummosis (80-90 % reduced) leading to increased yield of jackfruit. Higher yield obtained by six irrigation at 14 days interval with combination of NPK and cow dung@20 kg/plant in ring method	Farmers trained, training manual and leaflets developed. Dissemination and adoption of the technique by the surrounding farmers.
4	Studies on the Impact of Climate Change on Fungal Disease of Crops	June, 2013	Climate change impact on fungal disease & control and management (Impact of CC, Epidemiology of crop disease, disease management and farmers field validation)	Kinds of diseases changed due to CCI; Diseases incident increased 316 in 1980's to 1539 in 2010's (about 5 time higher), new diseased recorded; Fungicides Indofil, Rovral and Ridomil found effective in controlling *Alternaria* blight of mustard & Rovral against white mould of mustard; Minor change in cultivation practices could reduce disease incident.	830 farmers and 84 scientific staff trained, workshop organized, farmers were involved during on farm validation process. Booklet, leaflet preparing.
5	Production and development of the jute based blended fabrics in cotton processing system for textile uses	June, 2013	Production and development of Jute – cotton blended yarns and fabrics	Jute: Cotton ratio is 50:50 with 10^s is comparable 100 % cotton yarn/fabric.	MOU signed with two textile mills for large scale production.
6	Coordinated project on Contaminants and adulterants in food chain and their mitigation	June, 2013	Contaminants and adulterants in rice	About 10% -28% rice samples of industrial field & local market found contaminated with Cadmium higher than daily intake level Among 6 pesticide tested Carbofuran 10G was detected in the	Booklet/ leaflet published on-contaminant and adulterants in rice; improved technology for rice production and safe use of chemical in rice

Sl. No.	Title of Completed Project	Date of Completion	New Technology/ Knowledge Generated	Salient Features of Technology	Technology Dissemination/Utilization Status
				harvested rice	food preparation
7	Study on milk urea nitrogen (MUN) for improvement of dietary nutrition of dairy cows in Bangladesh.	Feb 2013	MUN: A Modern Diagnostic Tool for Improvement of Dairy Nutrition Protocol developed	Protocol development for MUN analysis. Higher milk production Use of MUN as an indicator of feeding to reduce feed cost and give higher income	Technological bulletin developed, limited dissemination

Through the on-going sub-projects, till date 35 transferable technologies have been generated and another 21 are in the process of development. Some of these technologies are already transferred by participatory approach or are nearly ready for transfer to the users. Further, at least 15 sub-projects have taken up for seed production, technology validation and adaptation programs at the farmers' level with their involvement. Notable, among these are salt tolerant rice, summer tomato, USG applicator, self-propelled reaper technology for the haor areas, water management in the hills, pest and disease management, lac culture and jute-cotton blended fabric, etc.

Once these innovated technologies/research information would fully transferred and adopted; these would not only fulfill much of the targeted NATP requirement of 'technologies for the extension/farmers need' but also will fill up the technological gap and thus bring positive changes in the production scenario and productivity leading to improvement of the farmers' livelihood.

Transferable technology generated to date under the SPGR sub projects

SL. No.	Sub project title & name of the PI	Name/ nature of technology generated	Salient features	Current status
A.				
1	Genetic enhancement of local rice germplasm towards aromatic hybrid rice variety development in Bangladesh Prof. Dr. M. A. Khaleque Mian BSMRAU, Gazipur	Two aromatic hybrid rice line	**Crop sub sector**	-Technological bulletin developed. -The variety awaiting approval of the National Seed Board
2	Development of salt tolerant rice varieties through induced mutation and marker-assisted selection: Dr. Mirza Mofazzal Islam, BINA, Mymensingh	New salt tolerance rice variety	-Salt tolerant (up to 12dS/m) rice variety Binadhan-10. -Suitable for coastal area during Rabi and Kharif-II season. Rice production 5.6 Mt/ha	-Technological bulletin developed. -Seed distributed in a limited scale. -National seed board approved the variety
3	Integrated crop management for the improvement of jackfruit Dr. M. A. Rahman, HRC, BARI, Gazipur	Improved management technique of jackfruit production	-Integrated Jackfruit production and management package. -Adoption of technology to increase jackfruit production, minimize farmers ' production losses leading to increased supply and income	-Farmers trained, Training manual and leaflets developed. -Dissemination done in a limited scale
4	Molecular characterization of Tomato Yellow Leaf Curl Virus (TYLCV) in Bangladesh and development of TYLCV resistant tomato using recombinant DNA technology Dr. Md. Abdullah Yousuf Akhond BARI, Joydebpur, Gazipur	Biotechnological intervention for TYLCV disease in Tomato	-PCR-based detection method of TYLCV TYLCV Resistant Tomato plant for adoption -Minimize production losses of tomato due to virus infection	-Technological bulletin developed. -Further research required to validate.
5	Development of hybrid summer tomato variety production packages and on farm validation of the developed technology Dr. Nazim Uddin, HRC, BARI	BARI Hybrid Summer Tomato- 8 variety production packages	-Higher production and increase availability of tomato in lean season. -Higher income of the farmers and employment	-Technology on production evolved and on- farm validation completed. -Farmers adopting the innovated technology. -400 persons trained

SL. No.	Sub project title & name of the PI	Name/ nature of technology generated	Salient features	Current status
6	Development of short stature wheat arieties tolerant to high temperature Mr. Md. Abdul Hakim, WRC, Nashipur, Dinajpur	Promising lines of heat tolerant wheat varieties developed	High temperature tolerant and short stature wheat varieties	-Technical bulletin prepared. -Dissemination on-going through farmers participation.
7	Genetic enhancement of sugarcane for sustainable productivity through tissue culture and molecular marker techniques Dr. Md. Amzad Hossain, BSRI	Improved sugarcane variety	Developed disease, pest, drought, water-log and salt resistant sugarcane germplasm through tissue culture techniques.	Being disseminated through farmers participation
8	Potentialities of major fruits farming, marketing system and price behavisor in hill regions of Bangladesh Dr. Md. Alamgir Hossain, BARI	Fruit farming and marketing system.	-Nature of marketing system, cost and efficiency in different seasons. -Developed appropriate policy guidelines for future improvement of fruit farming and marketing in the hilly areas of Bangladesh.	Being disseminated through farmers participation
9	Research and technology generation in lac as a means towards elevation of productivity and income of the small and marginal farmers. Dr. Debasish Sarker, BARI, Gazipur	Lac for poverty mitigation of the small and marginal farmers	-Increased lac production, less import and foreign currency saving. -Poverty alleviation through increased employment.	-10 lac villages and 3 mother orchards established. -10,000 host plants cultivated. -Over 200 farmers trained. -One booklet and one leaflet developed
10	Pyramiding Bacterial blight resistant Genes into Genetic background of BR 11 derived submergence tolerant rice lines Dr. A. K. M. Iftekharuddaula, BRRI, Gazipur	Development of disease resistant- cum-flash flood tolerant rice variety	A line has been developed by back crossing BRRIdhan52	Technical bulletin prepared
11	Development and validation of integrated pest management technologies in vegetable crops: A Coordinated Project Dr. Syed Nurul Alam, BARI, Gazipur	Safe vegetable production using IPM technologies	Bio-rational based management of insect and pests of tomato, yard long bean, country bean, okra cabbage/cauliflower by using sex pheromone traps along with management practices.	-Six booklet developed on the technologies, ---One book on preparation and four journal articles published. -Organized 8 ToT and 15 training programs along with 2 national workshops. -Technologies already transferred to the DAE and farmers.
12	Coordinated project on improvement of agro forestry Prof. Dr. Md. Giashuddin Miah, BSMRAU Component	Better livelihood through agro- forestry	-Multistoried system of agro-forestry developed for terrace and coastal ecosystem. -Farmers income increased from 22% to 282%	Communication material developed
13	Studies on the impact of climate change on fungal disease of crops Dr. Md. Sakhawat Hossain BARI, Joydebpur, Gazipur	Fungal disease control method of crops	-Quantified fungal disease incidence of crops. -Epidemiological studies of major fungal diseases of crops carried out and developed effective control measures.	Transfer of the technologies to the farmers on going
14	Development of integrated disease management technologies for soil borne pathogens Dr. Tapan Kumar Dey, BARI, Gazipur	Integrated disease management technique of soil borne pathogens	-Collated and identified different soil borne pathogens associated with major crops. -Developed control measures of soil-borne plant pathogens.	Disseminating technologies through farmers participation
15	Enrichment and conservation of mangrove ecosystem Dr. M. Masudur Rahman, Divisional Officer, Mangrove Silviculture Division, BFRI	Enrichment and conservation technique of mangrove ecosystem	-Determined better silvicultural techniques for major mangrove species. -Developed nursery and appropriate management techniques to conserve and enrich mangrove ecosystem for sustainable yield.	Disseminating technologies through farmers participation
16	Development of threshold level (seed health standard) of *Colletotrichum corchori* in jute seed Ms. Hasina Banu, BJRI	Developed jute seed health standard	-Developed threshold level and seed standard for the major seed- borne fungal pathogen, *Colletotrichum corchori* in capsularis (*Corchorus capsularis*) jute seeds. -Recommended the seed standard threshold value for seed- borne *C. corchori* disease in jute to the	On-farm validation continuing
17	Coordinated sub project on: Assessment of land productivity and	Coastal water assessment and promotion of cropping	-Monitored, assessed and mapped the quality of surface	Through screening and adaptation trial of saline prone varieties of crop

SL. No.	Sub project title & name of the PI	Name/ nature of technology generated	Salient features	Current status
	its enhancement through utilization of surface water in coastal area. Md. Khorshed Alam, SRDI , Krishi Khamar Sarak, Dhaka	pattern	water in the coastal saline area for safe irrigation -Assessed the impact of saline water irrigation on soils and crop productivity in saline area.	technologies validated.
18	Updating of fertilizer recommendation through interpretation of research results generated by the NARS institutes Dr. Md. Abdus Satter BARC	Updated fertilizer recommendation guide for Bangladesh	Updated fertilizer recommendation for crops and cropping patterns under different Agro-Ecological Zones (AEZs) Published	Launching of the publication to be don soon.
19	Utilization and management of sugar mills effluent water for irrigation purposes to increase crop production Dr. Md. Salim Ullah Khan Eusufzai, BSRI, Ishurdi, Pabna	Use as sugar mills effluent water for irrigation	-The physico-chemical properties of the effluent water was evaluated and found not harmful to soil and environment. -The performance study on the use of the effluent water on growth and yield of sugarcane was rewarding.	-Technique in effluent water use fo irrigation to solve much of the wate scarcity. -Recycling of natural resources to reduc environmental pollution.
20	Identification of production package for high value horticultural crops through hydroponics culture A.K.M. Selim Reza Mollik, BARI	Hydroponics, an alternative vegetable production technique and means of improved livelihood	Increased and round the year vegetable production through hydroponics culture.	-Advanced farmers are practicing in limited scale. -Meanwhile BRAC and BARI signe MoU in this regard
21	Sustainable management of available water resources of unfavorable hill ecosystem Dr. Md. Mohabbat Ullah, BARI.	Sustainable water use technique for hill area of Bangladesh	Developed appropriate water management technology and cost effective irrigation method for crop intensification and water productivity has brought fallow hilly land areas under cultivation.	Local people has already adopted th technology
22	Livelihood improvement of farming community in haor area through system approach Prof. Dr. Md. Sultan Uddin Bhuiya BAU, Mymensingh	Generation of agro-technology for livelihood improvement of the haor community	Identification and validation of appropriate haor ecosystem agricultural technologies and their in-situ validation.	Technological bulletin and manual developed.
Livestock sub sector				
23	Production of HYV vis-a-vis indigenous seed bulls to support smallholder dairying in Bangladesh, Prof. Dr. A.K. Fazlul Haque Bhuiyan, BAU, Mymensingh	Seed bull to enhance smallholder dairy production	Holstein-Friesian and Deshi, HF-Shahiwal- Deshi etc. cows with genetic characteristic are identified potential mothers and seed bulls are selected and registered.	Communication materials developed and 210 farmers trained, 26 Seed bulls are waiting for certification by Livestock Seed Certification Committee
24	Study on milk urea nitrogen (MUN) for improvement of dietary nutrition of dairy cows in Bangladesh Dr. Md. Sazadul Karim Sarkar, BLRI, Savar, Dhaka	MUN: A Modern Diagnostic Tool for Improvement of Dairy Nutrition	Protocol developed for MUN analysis. Higher milk production with reduced feed cost to enhance income	Technological bulletin developed
25	Studies on the quantitative trait loci (QTL) of economic traits in black bengal goat (BBG) Prof. Dr. Md. Omar Faruque, BAU, Mymensingh	Participating farming technique of pure black bengal goat for genetic improvement	Identified QTL marker. Marker assisted selection in progress Breeding protocol developed and maintaining pure seed stock.	Technological bulletin developed
26	A Coordinated project onto the surveillance of important infectious, zoonotic and emerging diseases of livestock and poultry in Bangladesh Prof. Dr. Md. Abu Hadi Noor Ali Khan ,BAU, Mymensingh	The surveillance of important infectious zoonotic and emerging disease of livestock and poultry	Adopting the molecular test protocols, zoonotic diseases could be identified in shortest time.	Technological bulletin developed
27	Approaches to develop broiler sire and dam lines from available genetic resources Prof. Dr. Md. Ashraf Ali, BAU, Mymensingh	Production Technique of day old broiler Chicks	Two male and female line parents developed for production of broiler strains. Two broiler strains, one white feather and another colored are expected to be released soon	Technical bulletin prepared
Fisheries sub sector				
28	Gene banking of improved brood stocks of Indian major carps (catla, rohu and mrigal) and development of breeding technique of three threatened species (mohashol, bagair	Gene banking technique of Indian major Carps, Breeding technique of baim fishes; Cryo preservation	-Genetic characterization of 3 IMCs -Development of breeding technique of baim fishes and Cryo (Semen) preservation	Technical bulletin developed

SL. No.	Sub project title & name of the PI	Name/ nature of technology generated	Salient features	Current status
	and baim) Prof. Dr. Md. Fazlul Awal Mollah BAU, Mymensingh	technique of Indian major carps	technique	
29	Assess of aquatic pollution and biodiversity of some lakes of Dhaka city Prof. Dr. M. Niamul Naser, Dhaka University, Dhaka	Unpolluted lake preserves environment and elevate fishery	Detected pollution controlling aquatic organisms which may be conserved and introduced in the lakes and water bodies for natural control of pollution	Technical bulletin developed
30	Contaminants and adulteration in food chain and their mitigation Dr. Md. Inamul Haque, BFRI component	Use of formalin in fishes, pesticides in dried fishes and their remedies	Technique in formalin identification in fishes and its determination; Developed improved method of dried fish preparation	Technical bulletin prepared
Farm mechanization, information technology and cross cutting				
31	Development and utilization of Bangladesh rice knowledge bank (BRKB) Dr. Md. Islam Uddin Mollah, BRRI, Gazipur	BRKB: an electronic knowledge hub on rice production technology	-Availability of a web. plus CD based information Piloting in 15 NATP upazilas -Included in the Prime Minister's program on 'Access to Information'. Skill development on the utilization of the information system.	Equipping the extension workers and farmers on the use and deriving material benefit
32	Development and adaptation of solar pump irrigation system under eco-friendly environment Dr. Md. Ayub Hossain, BARI, Joydebpur, Gazipur	Solar irrigation: An approach towards renewable energy use	-A new and suitable centrifugal solar pump designed and assembled. -Suitable for surface water lifting by renewable energy. -Less dependency and reduced production cost particularly for vegetables	Technical bulletin developed
33	Development and validation of USG applicator and rice trans planter Md. Anwar Hossen, BRRI, Gazipur	Urea Super Granule Applicator	-Adjustable USG applicator for farm use -Reduction in urea use, production cost and balanced fertilization. -Rice transplanter toincrease labor efficiency -Higher rice production & cropping intensity	Several training programs conducted; two brochures prepared on the use of applicator
34	Design, development and modification of self-propelled reaper and mini power tiller to augment crop production Md. Mahbubul Alam Zami, BRRI, Gazipur	Self-propelled reaper and mini-power tiller	-Reduction of 70-80% harvest cost and minimize post-harvest losses -Increased farm production and income	Technical bulletin prepared
35	Production and development of the jute based blended fabrics in cotton processing system for textile uses	Development of Jute base fabric	Protocol developed for viable of Jute-cotton blending; Increased use of jute replace to cotton and minimizing import	Transfer of technology with the entrepreneurs awaiting, soon MoU would be signed with 2 textile mill

Technologies in pipeline under the SPGR sub-projects

Sl. No.	Name of the Sub Project	Name and Address of PI	Objectives	Status/Remarks
1.	Coordinated project on arsenic in soil-water-plant system	Member Director(NRM) BARC, Farmgate, Dhaka-Coordinator PIs: a)Muhammad Sajidur Rahman, SSO, Soil Science Division, BRRI b)Dr. Shamsun Noor CSO and Head, Soil Science Division, BARI c)Dr. Gazi Md. Zainal Abedin SSO, SRDI, Dhaka	-To study the impact of arsenic contaminated soil and water in crops -To find out arsenic tolerant species/varieties of different crops -To study the effect of different soil amendments for arsenic mitigation and to prescribe suitable management practices.	Yield loss management and Arsenic mitigation techniques are expected to be evolved.
2.	Generation of short duration high oil content high yielding doubled haploid (DH) rape seed through	Dr. Md. Shahidur Rashid Bhuiyan, Professor, Dept. of	-To develop short duration higher yielding rapeseed genotypes which can fit well into Aman – Rapeseed – Boro cropping pattern.	Much progress made in developing high yielding DH mustard crop.

Sl. No.	Name of the Sub Project	Name and Address of PI	Objectives	Status/Remarks
	microspore embryogenesis.	Genetics and Plant Breeding, Sher-e-Bangla Agricultural University,Sher-e-Bangla Nagar, Dhaka	-To develop yellow seed materials which will give 34% more oil then the usual brown seeded ones.	
3.	Coordinated sub-project on soil fertility and fertilizer management for crops and cropping patterns	Member Director(NRM) Bangladesh Agricultural Research Council, Farmgate, Dhaka -1215	-To determine fertilizer requirement for major crops and cropping patterns including horticultural crops(vegetables, fruits & flowers)and fodder in some selected AEZs of Bangladesh -To assess the changes in soil fertility under different cropping patterns and soil fertility management practices	Certain research information generated which has been inducted by now in the national fertilizer recommendation guide. More research information awaiting to be obtained.
4	Application of microsatellite markers for screening and identification of iron rich rice genotypes	Dr. Lutful Hassan Professor, Department of Genetics & Plant Breeding (Biotechnology & Genetic Engineering Lab.), BAU, Mymensingh	-To screen rice varieties including wild relatives viz. Sada Binni, Kalo Binni and Lal Binni for identifying the iron-rich rice -To determine the iron content of rice germplasm from the grain. -To observe the phenotypic performance of rice germplasm for enhanced iron and to identify the iron rich rice germplasm using microsatellite markers	Rice rich in Iron to help in reducing anemia and much of the nutrient deficiency problem
5.	Coordinated sub-project on improvement of agroforestry practices for better livelihood and environment: BARC Component	Member Director (NRM) Bangladesh Agricultural Research Council, Farmgate, Dhaka -1215	-To promote productivity in forest resources in different ecosystem. -To assist in attaining better livelihood by ensuring food security, health and environment through agro-forestry	Activities to generate technology/research information for adoption of modern agro-forestry practices and contribute towards elevating productivity, income and sustaining environment.
6.	Coordinated sub-project on water management for enhancing crop production under changing climate: BARC Component	Member Director(NRM) Bangladesh Agricultural Research Council, Farmgate, Dhaka -1215	-Develop appropriate water management technologies for increasing crop production, cropping intensity, irrigation efficiency, land and water productivity for improved livelihood -Identify appropriate water resources management technologies to mitigate consequences of climate change	The water management aspect of cropping under changed climate to assist farmers in pursuing sustainable farming.
7.	Coordinated sub-project on addressing climate change on fisheries sector through community based technology identification and adoption in the fragile aqua- ecosystems of Bangladesh.	Member Director(Fisheries) Bangladesh Agricultural Research Council, Farmgate, Dhaka	-Identify climate change related major vulnerable issues of fishers' and small aquaculture communities, -Develop guidelines for climate change adaptation framework and pilot the identified technology options within the targeted communities.	Participatory research to generate community based technology/research information for adoption by the fishermen and to help them to apply as mitigation /adaptation measures in changed climatic situation.
8.	Coordinated sub-project on contaminants and adulterants in food chain and their mitigation.	Member Director (Fisheries) Bangladesh Agricultural Research Council, Farmgate, Dhaka -1215	-Undertake investigation to address the issues of adulteration in food items. -Determine the method of safe use of ripening agents, mitigation techniques, etc. -Develop communicative materials, arrange awareness program for safety and human health.	Efforts are to develop usable technique to be followed by the farmers for production; entrepreneurs for processing and marketing and the consumers to be aware and cautious on consumption.
9.	Assessment of socio-economic Impacts of oilseeds Research and Development in Bangladesh	Dr. Md. Abdul Monayem Miah, BARI, Gazipur	-To assess variety-wise adoption of improved oilseed technologies at farm level and to find out the factors affecting their adoptions, dis-adoptions, non-adoptions and sustainability. -To study the economics of improved oilseed crop production in Bangladesh along with its impact on the livelihood of the farmers.	Study to assess success/constraints leading to policy and R& D options.
10.	Assessment of socio-economic impacts of pulses research and development in Bangladesh	Dr. Md. Abdul Matin PSO, Regional Agricultural Research Station, BARI, Jamalpur	-To assess variety-wise adoption of pulses technologies at farm level and to find out the factors affecting their adoptions, dis-adoptions, non-adoptions and sustainability. -To measure the comparative advantage, profitability and resource use efficiency of pulses production in Bangladesh along with its impact on the livelihood of the farmers.	Study to assess success/ constraints leading to policy and R & D options.

Sl. No.	Name of the Sub Project	Name and Address of PI	Objectives	Status/Remarks
11.	Coordinated sub-project on the Development of an effective PPR vaccine from local isolate and its molecular Characterization	Member Director (Livestock) BARC PI: a)Dr. Emdadul Haque Chowdhury, BAU, Mymensingh b) Dr. Md. Giasuddin, BLRI, Savar, Dhaka	-Development of PPR vaccine seed from local isolate(s). -Molecular genetic analysis of field and vaccine isolate(s) -Development of serologic and nucleic acid based diagnostic methods to determine the immune response of vaccine seed and for the early diagnosis of PPRV infections and their comparative efficacy	PPR from local isolate to be effective and sustainable for goat productivity, employment and economic return.
12.	Pyramiding salinity and submergence tolerance genes into BRRIdhan49 through marker assisted selection	M. Akhlasur Rahman, BRRI	-Combining the *SALTOL* with *SUB1* locus to develop varieties for areas affected by both salinity and submergence -Introgression of *SUB1* and *SALTOL* QTL into the genetic background of BRRIdhan49 through marker-assisted backcrossing	Investigation, if successful, could lead to the expansion and productivity in the salt affected, water logged coastal areas of Bangladesh.
13.	Development of an integrated management approach for quality seed production of Kharif Onion	Md. Alauddin Khan, BARI	-To identify improved technologies for better shelf life of Kharif onion seed bulbs -To find out improved management practices on the yield, viability and vigor of kharif onion seed	Expecting success in quality seed production technique.
14.	Identification of male sterility in onion lines	Dr. Md. Noor Alam Chowdhury, BARI	-To identify the naturally male sterility line in onion field -To standardize the concentration of the chemical for development of male sterility -To standardize the number of sprays and stages of chemical application to develop male sterility onion line	Some success attained in identification of male sterility onion lines. Further work in progress.
15	Selection of elite lines and improved production technologies for oilseed crops	Dr.Md Rawshan Ali, BARI	-Selection of elite lines for development of short duration high yielding varieties of rapeseed-mustard, groundnut, sesame, soybean and sunflower having tolerant to disease and insect. -Selection of drought and saline tolerant lines for development drought and saline tolerant varieties.	Improved production and management techniques for oilseed are in the process of development.
16.	Improved potato storage facility for farm household	Prof. Dr. A. T. M. Ziauddin, BAU	-To develop and test an improved evaporative cooled potato store for farm household -To identify the optimum storage design structure by data analysis and modelling	Low cost technology to help farmers to preserve their produce, and get higher income. Design part completed. Prototype developed and further refinement on.
17.	Marketing and value chain system of brackish water and marine fisheries products and by-products in Bangladesh	Dr. M. Serajul Islam, BAU, Mymensingh	-To examine the existing marketing system, value chainof brackish water and marine fish products and by-products. -To identify the institutional and non-institutional barriers and constraints in brackish water and marine fisheries products marketing	Production and policy interventions to assist the producers and improve the overall supply chain.
18	Coordinated sub-project on farming system research and development for farmers' livelihoods improvement component	Member Director (Crops), BARC, Farmgate, Dhaka	-To develop location-specific system-based technologies. -To integrate component technologies (crops, livestock, fisheries and agro-forestry and homestead, etc.) for improving far practices and establish linkage with different stakeholders. -To assist in improving family income and livelihoods.	Development of integrated farming method for different agro-ecological zones to assist the farming community to elevate production, income and livelihood.
19	Development of hybrid rice and production of parental lines	Dr. A. S. M. Masuduzzaman, BRRI	-To develop hybrid rice and cost effective quality seed production technique. -To scale up yield maximizing technologies of BRRI developed hybrid rice varieties	Advancement in hybrid rice development to enhance production and help to earn higher return.
20	Study on the prevalence of parasites of economic importance in cattle in Bangladesh	Dr. Mohammad Alamgir Hossain, CVASU, Chittagong	-To study the prevalence of parasites in cross-breed and local cattle calves. -To Formulate suitable protocols towards prevention and control of important parasitic diseases of cattle calves in hilly and coastal areas of Bangladesh.	Research to lead in finding solution to control and prevent calve rearing problem.
21	Isolation and molecular characterization of egg drop syndrome (EDS-76) virus in Bangladesh	Dr. Marzia Rahman, BAU, Mymensingh	-Study sero prevalence of EDS in chickens of commercial poultry farms. -Isolate and identify EDS-76 virus from the samples of seropositive flocks. -Characterize the isolated virus biologically and molecularly.	Information generated to assist finding solution of EDS and thus assist the poultry farming community.

National and International Linkages: PIU-BARC is striving to develop linkage with various CGIAR institutions namely, CIMMYT, IRRI, World Fish etc. By now, one SPGR sub-project on agroforestry is being jointly implemented with the participation of ICRAF, Nairobi, Kenya. As far as the national linkage is concerned, PIU-BARC has established strong linkages with all the NARS institutes and public universities.

Presentation of research articles by the scientist(s) in different programme: From research works

under SPGR, by now 42 scientific articles have been published in reputed journals and many more are being awaited for publication.

Publication(s) by the division/section in different journals/media: As regards, print and electronic media coverage, 42 TV programs have been captured on the achievements of the SPGR activities. About 84 technical bulletins on SPGR have been published so far. Over 14 training materials and 25 bulletins have been published by now and distributed. Besides, a notable number of success stories in the print media and many different booklets, flyers, manuals, etc., have been published as well on the sub-project activities and their attainments.

LIVESTOCK

The Livestock Division of BARC is involved in organizing and managing various research and other related activities for developing the livestock sector in Bangladesh. To carry out the mandated responsibilities of BARC and to full-fill the national need the division is entrusted with the duties of planning, reviewing, prioritizing, approving, monitoring, evaluation, supervision and coordination of the livestock research programs implemented by the relevant NARS institution and other institutions including universities, Department of Livestock Services (DLS) and NGOs. The division is providing training and research support to the NARS institution, DLS, relevant faculties of various educational institutions and NGOs. The division is imparting policy support to the relevant NARS institutes and extension agencies. The division is arranging, conducting and participating in training, meetings, and seminars/workshops. The division is also engaged to support national avian influenza/bird flue prevention and control programs, to recruit scientists/officers in NARS institutes, to support researches of NARS institutes, and to support different activities of National Agricultural Technology Project- DLS Unit.

Project Development/Project Financing

Research projects under funding from NATP-SPGR

There were a total of 9 on-going SPGR research sub-projects from Bangladesh Livestock Research Institute (BLRI), Bangladesh Agricultural University (BAU) and Chittagong Veterinary and Animal Sciences University (CVASU). These research projects developed with the leadership/co-ordination of Livestock Division, BARC were funded under SPGR, PIU-BARC, National Agricultural Technology Project, Phase-1, BARC. Brief progress of these projects have been reported under NATP.

Research Projects Under Funding From Research Grant

There were a total of 2 on-going research projects from Bangladesh Agricultural University (BAU) and Haji Danesh Science and Technology University, funded under Research Grant of BARC. These research projects developed with the leadership/co-ordination of Livestock Division, BARC. Livestock Division, BARC was directly involved for overall coordination, supervision and regular monitoring of these project activities. Fund release and brief progress of these projects during the year 2012-2013 are given below.

Isolation, Identification and characterization of the etiological agent of infectious coryza in chicken and development of its effective remedial measures: The present study was conducted for isolation, identification and characterization of *Haemophilus paragallinarum* from layer chicken in Bangladesh. The samples were collected from suspected birds of different areas of Rangpur division based on age, sex, breed, temporal and spatial differences for the isolation and identification of *Haemophilus paragallinarum* by cultural, morphological and biochemical properties. The overall prevalence of *Haemophilus paragallinarum* was about 47.54 %. The prevalence was very high in laying hen (52.8%) compare to grower (42.8%) and prelayer (16.6%). The prevalence of *Haemophilus paragallinarum* in Dinajpur, Rangpur and Thakurgaon were found 86.67%, 25%, and 34.21% respectively. The isolates were resistant to norfloxacin and tylosin but sensitive to amoxycillin and gentamicin. Then the isolates were used for DNA extraction by EZ -10 Spin Genomic DNA kit (Bio Basic Inc.) according to the manufacturer recommendation for molecular characterization.

Epidemiological investigation of anthrax and determination of efficacy of local anthrax vaccine in Bangladesh: The research project was undertaken to identify the causes of repeated outbreak of anthrax and determination of the efficacy of local anthrax vaccine in Bangladesh. To achieve the goal data and representative samples were collected from the outbreak areas. Remarkable progress of the research outcomes were observed during the tenure (2012-2013). Important influencing factors of the outbreaks were identified and *B. anthracis* was successfully

isolated and characterized following cultural, morphological and biochemical examination. To determine the efficacy of local anthrax vaccine animals were vaccinated with the Anthrax spore vaccine produced by LRI, Mohakhali, Bangladesh following usual vaccination schedule.

Research Highlights of BLRI

BLRI conducted a total of 28 research projects/ programs during the year 2012-2013. Research highlights of some of these projects/programs are given below:

Conservation and Improvement of Native Chicken: The improvement of productivity of indigenous chicken is a long desire in the country. Present research is a part of the long-term selection program being undertaken to evaluate the carcass characteristics and expected response to selection of second generation (G_2) of indigenous chicken under intensive management in Bangladesh. A total of 1643-day-old chicks comprising of 3 types of chicken namely Naked Neck (NN), Hilly (H) and Non-descript Desi (ND) were hatched in a two batches for this study. In second generation (G_2), selection was practiced at 3 (three) stages of birds` life, firstly and secondly at 8 and at 16 weeks of age, selection was performed on the basis of breeding value for 8 and 16 week body weight. Thirdly, at 40-week of age, on the basis of an index comprising the parameters of age at sexual maturity (ASM), body weight (BW), egg production (EP) and egg weight (EW). Improvement target of egg weight was to increase by 1g, egg production rate was to increase by 2 % per generation. The results revealed that among the indigenous genotypes H genotype was superior in terms of body weight, and NN genotype was for dressing percentage. NN genotype was also found reaching maturity earlier but attaining a lighter mature weight. In each generation slight response was obtained for selection. As a result of selection; EP, BW increased and ASM reduced in second generation than that of the foundation stock. These findings give an impetus for continuing the pure breeding research for more generations.

Evaluation of performances of BLRI developed native duck germplasm: This study was taken to evaluate the growth and laying traits of BLRI developed native duck germplasm of comparatively larger population with aim of effective selection. A total of 850-day-old ducklings comprising of 2 native ducks namely Rupali and Nageswari were hatched for this study. Ducklings were maintained under intensive management condition. Production performance and egg quality data were analyzed by General Linear Model (GLM) univariate procedure in SPSS computer program. Fertility rate of Nageswari (66.30%) duck is higher than rupali (65.91%) duck but hatchability rate is better in Rupali then Nageswari duck. Duckling weight was influenced by the egg weight ($P<0.05$). The duckling: egg ratio data shows that newly hatched ducklings in the Rupali duck had higher percentage (57.99) than duckling in the Nageswari (56.83). As a result of selection, body weight at 12 weeks of age was expected to improve by 76.58 vs 20.00; 64.50 vs 15.02 g respectively for Rupali and Nageswari males and females. There was no significant ($P>0.05$) variation in feed intake and FCR among the duck genotypes. The age at sexual maturity was significantly ($P<0.05$) affected by genotype. Rupali duck start laying eggs at higher age (158 days) as compared to Nageswari duck (151 days) genotype. Duck weight at sexual maturity, egg weight at first lay and egg production were not influenced ($P<0.05$) by genotype. Higher egg production was found in Nageswari (45.73) than Rupali (41.02) duck, but difference was not significance. Breaking strength was highest in Rupali duck (4.4 kg/cm^2) and lowest in Nageswari (4.3(kg/cm^2) duck egg. Shell thickness was not affected ($P>0.05$) by genotype. Rupali ducks laid eggs of thicker shell (0.45mm) compared to Nageswari duck (0.41mm) eggs. For conservation and improvement of native duck genotype the selection and breeding program should be continued, because the result presented here is only 30 weeks from hatch. Egg production and egg quality will be assessed at 40, 48 and 56 weeks of age.

Conservation and Improvement of Quail: Individual selection is particularly indispensable in selection experiments for body weight in quail. Body weight is highly heritable trait. Presently Japanese (J), White (W), Black (BL) and Brown (Br) quail varieties have been maintained in the institute. Using these stocks and deliberate breeding policies it is possible to develop a meat type quail for our existing farming system. The breeder males and females were being maintained in cages for single pair mating. At first generation (G_1) the chicks were produced from hatching eggs collected from every single pen of the selected birds. At least 4 generations of pedigree hatching will be done to homogenize their genetic characters. At 5^{th} week of age, male and female quail of first generation (G_1) were selected to produce 2^{nd} generation on the basis of breeding value according to their 5^{th} week body weight. A total of 1953-day-old chicks comprising of 4 types of quail namely W, Br, Bl and J were hatched in a two batches to produce second generation (G_2). Body weight of Quail has to

be gone up from the initial five-week body weight of 110 g to 150 g at fifth week of age. Pedigree records have been kept by using commercially available leg bands to identify quail of all ages. As a result of selection, body weight at 5 weeks of age was expected to improve by 4.34 vs. 6.51; 1.21 vs. 4.33, 1.68 vs. 3.77 and 1.02 vs. 2.40 g; respectively for J, W, Br and Bl males and females. These findings give an impetus for continuing the pure breeding research for more generations.

Conservation and validation of Shuvra parent: Bangladesh Livestock Research Institute has developed a layer strain named shuvra from the 4 pure lines collected from Japan. Therefore, BLRI conserving the pure lines to produce next generation of Shuvra parents and to distribute the Shuvra parents among the selected breeding farms having MOU with BLRI. For conservation 1000 day old chicks produced and data collected from both the male and female lines, e.g. age at 1st lay (day), body weight (38wk), egg production (up to 48 weeks) and egg weight (38wks). Females were finally selected on individual egg production records and males were selected on family average. The performance results showed that fertility rate was higher in male line (95.10) than the female line (90.75) and percentage of sound chicks found higher in male line (85.25) than female line (80.41). The average adult body weight at 38 weeks of age found 1390±0.09 and 1796±0.10, and age at 1st lay was 144 and 147 days respectively in male and female lines. The male line got maturity earlier than the female line and egg production rate was comparatively higher in female line. For validation of shuvra parents a total of 19230 hatching eggs of both lines distributed to two breeding farms (Phenix and Eco hatchery) and 2350 eggs were hatched at BLRI. Considering the parameters of productive and reproductive performances of parents BLRI parents perform better than the others while Phenix perform moderately and Eco got the lowest rank of performance. From the findings of the research it may be concluded that for better and secured conservation keeping the parent lines in different suitable locations as well as for multiplication and distribution of shuvra parents the research facilities at BLRI should be increased. On the other hand, production performance of Shuvra parent varied in different breeding farms due to variations in management.

Study on protein concentrate development and growth performance of hilly chicken: Protein concentrate, a human or animal dietary supplement that has very high protein content and is extracted or prepared from vegetable or animal origin. The development of cheap sources of energy and protein of animal origin to replace the traditional feed is of utmost economic importance. The existing protein content and amino acids of some commercial protein concentrates were analyzed. A developed protein concentrate was also analyzed which comprised of several processed ingredients (moringa leaf meal, offal meal, feather meal, blood meal & hatchery waste). Three hundred hilly chicks were studied to assess their growth performance with different protein levels & also addition of moringa leaf meal. Moringa leaf meal enhanced growth of hilly chicken, around 130 g/bird more growth was recorded during 8 weeks of age with an overall FCR 2.73. Addition of moringa leaf meal in the diet showed better growth performance like commercial growth promoter without affecting internal organs development. In case of male, overall growth increment was about 200 g more than a female hilly chicken during 8 weeks of age. Addition of moringa leaf meal showed a better growth performance and the level was found upto 2 percent of the basal diet. It was also observed that 22% crude protein is suitable in terms of feed conversion efficiency and growth performance at 8 weeks of age.

Comparative study on morphological characteristics and biomass yield of different seasonal fodder crops: BLRI Napier-4, Napier-Japan, Wruk-wona & Merkeron were compared with BLRI Napier-3 in terms of tiller number per hill & biomass yield under similar agronomical practices in the red soil area. Average DM yield per hectare in 45 days of growth (7.57, 2.94, 1.23, 2.32, 3.89 & 7.57 tons, respectively), tiller number (27.3, 21.5, 49.8, 28.0 & 30.2, respectively; $p<0.05$) & crude protein (11.5, 12.9, 13.7, 14.4 & 10.4, respectively; $p<0.05$) content ranked BLRI Napier-3 top. BMR Octene & Sugergraze, were cultivated as a sole crop or in combination with Oat or Triticale (1:1). The DM yield (ton/hectare) of the crop was 3.48, 2.68, 6.68 and 6.2, respectively; and any combination of the former with the latter had significantly ($p<0.05$) lower DM yield, and a lower CP content of the former (12.6% & 12.5% on DM basis) compared to Oat (13.5%) or Triticale (17.4%) failed to attract their mixed cultivation.

Screening and identification of salt tolerance levels of high yielding fodder cultivars available at BLRI: BLRI Napier-1, BLRI Napier-2 and BLRI Napier-3, BLRI-Napier-4, Splendida, Para, Merkeron, Alfalfa, BMR and Sugar Grass were grown in hydroponic system for evaluating their biomass production in 06 ds/m, 09 ds/m or12 ds/m salt concentration. It was observed that all fodder

varieties survived at 06 dS/m except Alfa-Alfa. However, Splendida among the tested fodder crops, has the capacity to survive up to 12ds/m.

Study on taxonomical identification and biomass production of Moringa species as a fodder crop: The available Moringa plants were collected from different regions of the country and evaluated taxonomically with the help of National Herbarium, Bangladesh, and the most of the domestic varieties were identified as *Moringa oleifera lam*. The tree plant was grown in a research plot under a constant agronomical practice and biomass yield was evaluated at three cutting heights (1.5', 2.0' and 2.5') in 40, 50 or 60 days of growth. Increasing growth period significantly increased biomass yield per hectare (4.49, 9.63, 14.7 ton/ha, respective); but height of the plant had no definite trend on biomass yield.

Study on feeding effect on production performance of pregnant mother and neo-natal calves under on-station condition: The study was conducted to know the effects of feeding on productive and reproductive performances of pre-natal and post-natal RCC cows under on-station condition. Sixteen pregnant RCC cows having pregnancy 6-7 months and between 1 to 3 parities were allocated randomly into four dietary treatment groups (Standard diet T_0 (NRC, 1995); T_1 (5% below of standard diet), T_2 (5% plus with standard diet), T_3 (10% plus with standard diet) and their performance was compared with similar cows reared on farm practice. Daily weight gain of cows for first four dietary groups was significantly ($p<0.05$) higher than that of the cows under farm practice (T_4). Pre-natal feeding of a standard diet or diets with ±5.0 nutrients had increased daily growth of dams, higher birth weight of calves and daily milk yield.

On-farm testing of pre and post-natal feeding system for RCC at Satkania, Chittagong: Twenty Red Chittagong cows of 2nd or 3rd parity and at least seven months of pregnancy dividing into two equal groups were randomly fed on-farm either with a formulated diet containing calculated energy & protein according to ARC (2009) or the same diet with 25% higher concentration of the two nutrients. The former diet practically having a negative balance of the nutrients compared to ARC (2009) resulted in 0.73 MJME and 7.56 g CP intake per $Kg^{0.75}$. It showed an average pre-natal daily LW gain of 484g/head and average birth weight of 13.4 Kg/calf compared to 619g/head and 15.1 Kg, respectively of the cows fed with the other diet that resulted in daily per $Kg^{0.75}$ weight intake of 1.03 MJME & 10.5 g CP. The two diets having variations in the intake of energy and protein in post-natal condition resulted in daily gain & milk yield of 122g & 1.97 Litre; and 274g & 2.5 Litre, respectively.

Study on growth and meat quality of native and Brahman crossbred bulls at different ages: Age (18, 24 and 30 months) and breed effects on growth performance, meat yield and meat quality of Pabna, RCC and Brahman crossbred bulls under similar plane of nutrition were studied. A total of 42 bulls of three age groups of the genotypes dividing into 9 unequal groups reared on a single plane of nutrition for 125 days including a 7 days collection period. Both Pabna & RCC, irrespective of their age, had higher feed conversion efficiency (9.5 & 9.9), lower cooking loss (24.0% & 26.0%) than Brahman crossbreds (12.1, 28.8%). Advancement of age reduced feed efficiency & increased cooking loss significantly ($p<0.05$). Meat & bone ratio, on the other hand, was the highest in Pabna (3.94) followed by RCC (3.83) & Brahman cross (3.66), and it was increased by age. Native bulls were more efficient in producing higher quality beef cost effectively than Brahma cross.

Study on within breed genetic variability at DNA level among BCB-1 cattle: This study aimed to identify heterozygosity among generations of BLRI Cattle Breed-1 (2nd, 3rd, and 4th of BCB-1) at genetic level & to find out their genetic distance using TGLA227, HEL09, BM2113 and CSSM66 microsatellite markers. The mean number of alleles were 3.00±0.82, 2.75±0.96 & 2.75±0.96, and their corresponding observed heterozygosity were 0.4954±0.0700, 0.4657±0.0799 & 0.3856±0.0835, respectively. Cluster 1 consisted of 2nd & 3rd generations and cluster 2 consisted of 4th generation. The reduction of heterozygosity in the subsequent generation might be associated with the higher genetic distance from 2nd and 3rd generations to 4th generation. These results indicate that selection pressure on BCB-1 for increasing meat and milk production and uniformity in coat color may have resulted in the loss of some allele in descendants with a reduced mean number of allele and heterozygosity of BCB-1 cattle in subsequent generations.

A Study on Determination of Dairy Cattle and Poultry Production Coefficient: The study revealed that mostly female and children were involved in livestock rearing especially for poultry rearing. It showed that on an average, male members spent about 73.27 (family and hired) and 3.10 hours, a month on dairy cattle and poultry rearing, respectively, while the female members spent 26.73

and 11.30 hours a month on dairy cattle and poultry rearing, respectively. Total annual returns from livestock production were estimated at Tk. 43077.43 and Tk. 12424.50 for dairy cattle and poultry rearing farmers, respectively. On the other hand, the corresponding net returns were Tk. 21979.61 and Tk. 10195.23, respectively. The undiscounted benefit cost ratio of dairy cattle and poultry rearing was 2.04 and 5.57 for dairy cattle and poultry rearing farmers, respectively, implying that both the enterprises were profitable. The contributions of livestock rearing to total income were 28.62 and 8.25 percent for dairy cattle and poultry rearing farmers, respectively.

Applications of ovum pick up based *in vitro* embryo production system (OPU-IVF) for multiplication of high yielding Red Chittagong cattle (RCC) at BLRI research farm Activity: Establishment of *in vitro* embryo production system with slaughterhouse ovaries: The ultrasound-guided trans-vaginal ovum pick-up based *in vitro* embryo production (OPU-IVP) is used for copying and distribution of high yielding cows in many developed countries. Application of this tool in the traditional cattle breeding requires a consistent embryo culture, storage and transfer system. During this study, ovaries were collected from slaughtered cow ovaries for standardization of the *in vitro* embryo production protocol. Results showed that 74.16±5.49% of the total immature COC were matured as detected by presence of first polar body. About 62.05±7.07% of the matured oocyte cleaved followed by *in vitro* fertilization process. Blastocyst development rates were 14.00%. In conclusion, the *in vitro* embryo production technology was standardized at BLRI laboratory. Through application of this technology we can produce at least 20 calves from a high yielding cow per year in place of single calf from natural breeding. It will facilitate profitable dairying in Bangladesh.

Molecular Epidemiology of highly pathogenic avian influenza virus in Bangladesh and in vitro expression of viral proteins: Avian influenza was first detected in Bangladesh in March 2007 near the capital Dhaka by the National Reference Laboratory for Avian Influenza till May 2013, 555 outbreaks have been recorded so far of which 498 in commercial chickens and 57 in backyard chickens. There are 6 epidemic waves of AI out breaks have been observed in Bangladesh from March 2007 to May 2013. The persistence of the virus in poultry over a wide geographic area may increase the risk that a mutant virus might evolve to initiate a human pandemic. In this regards it is necessary to continue characterization the circulating viruses. Topology of the phylogenetic tree shows that all H5N1 viruses of the clinical samples collected from different areas of Bangladesh under these studies belong to the 2.3.2.1 clade and similarity ranged between 97.4% and 100%. They cluster with H5N1viruses previously collected in Bangladesh and with sequences from Nepal (2011-12), Myanmer (2010-11) and India (2011-12). It was observed that clade 2.2 viruses are being replaced by clades 2.3.2.1 virus that has been in circulation since 2007. Out of 250 samples 13 samples were found Hemaglutinin positive and 7 samples were influenza positive where 4 were H5 positive.

Study on efficacy, potency and safety of BLRI developed enterotoxaemia toxoid, Sub-title: Field trial of Sodium alginate-adsorbed *Clostridium perfringens* type D toxoid against clostridial enterotoxemia in natural host: The field trial of developed *Clostridium perfringens* type D toxoid in natural host was done in the prescribed manner. A total of 24 apparently healthy clostridia disease free goats (six months of age) was selected and divided into four groups. Each group consists of 6 goats. Type D toxoid was inoculated subcutaneously at the rate of 3 ml, 6ml and 9ml per goat but in case of control group 3 ml of diluents was inoculated subcutaneously and observe up to 14 days. After 7 days, challenged with toxin and observed for 7 days again to know the potency of BLRI developed epsilon toxoid. From the result it was found that BLRI developed toxoid provided a significant protection to vaccinated goats in experimental challenge as demonstrated by its high efficacy index 94%. From the results, the average mortality rate for the control group was 8 times higher than that of the vaccinated group. So, it can be concluded that that the developed toxoid seems to be protective against clostridial enterotoxaemia in goat.

Attenuation of contagious ecthyma virus isolated from goat: Selection of suitable candidate virus followed by its attenuation is indispensable to develop a vaccine. To achieve the objective, previously collected and polymerase chain reaction (PCR) positive 20 samples were passaged in Vero cell. Six blind passages were given to isolate CE virus (CEV). PCR positive samples found negative up on 6^{th} passage were considered negative for virus isolation. PCR is employed to detect the virus. From these two viruses were isolated. During passage in cell culture, host viral interaction like, appearance cytopathic effect (CPE), replicability and adaptation etc. were observed. In conclusion, serial passage of selected viruses may be continued to attenuate the

virus. It will be good to check the viral existence after each passage. After certain passage the sequence of virus may be read to check any mutation.

Isolation and identification of *Lactobacilli* and/or *Bifidobacteria* from Bangladeshi indigenous poultry and their molecular characterization for potential use as probiotics: Probiotics are living micro-organisms which, upon ingestion in appropriate numbers, exert health benefits beyond inherent basic nutrition. In this study we aimed at the isolation, identification and characterization of potential probiotic *Lactobacillus* and *Bifidobacteria* strains from Bangladeshi indigenous poultry, in order to evaluate their suitability for commercial use in poultry industry. Thus, a total of 61 birds (27 deshi/indigenous chicken, 6 naked neck chicken, 5 hilly chicken, 5 wild chicken and 18 ducks) were used for the isolation of *lactobacilli* and *bifidobacteria*. Conventional biochemical and carbohydrate metabolism properties of the isolates were conducted. For the confirmatory identification of the isolates, two universal primers for the amplification of 16S RNA gene coding region of *Lactobacilli* and *Bifidobacteria* have been selected for PCR amplification. In the next phase of the study, it is planned to conduct molecular characterization and determination of the probiotic properties of the isolates.

Study on flock management of sheep in delta region: A total of 384 and 256 sheep of different ages were selected respectively in Golachipa and Kalapara upazilla with the purpose to know farm management, health practices, level of parasitic infection and occurrence of diseases and mortality. A standard questionnaire was developed and pre-tested, and then the data were collected by personal interviews. In Kalapara, most of the farmers dewormed their sheep and vaccinated against PPR but in farmers of Golachipa they did not deworm and vaccinate to their sheep regularly. Different diseases (Diarrhoea, Pneumonia, Bloat, Abortion and Alopecia) of sheep were found in both upazila but FMD and PPR were found only in kalapara upazila. In sheep of Golachipa upazila, we were identified seven species of GIT parasites, namely *Strongyloides papillosus* (44.7%), *Trichostrongylus axei* (69.5%), *Haemonchus contortus* (85.7%), *Moniezia* (18%), *Trichuris sp* (4.76%), *Coccidia* (58.33%) and *Ascaris sum* (6.94%). On the other hand, six species of GIT parasites in kalapara upazila were identified, namely *Strongyloides papillosus* (13.6%), *Trichostrongylus axei* (33.3%), *Haemonchus contortus* (54.5%), *Moniezia* (18%), *Trichuris sp* (7.5%) and *Coccidia* (39.3%). Among the diseases, diarrhoea was found highest in both upazilla. E coli was the highest prevalent for diarrhoea in sheep of both sites. Subclinical mastitis in sheep of both upazilla was also the important problems for rearing sheep.

Research Support

Research project proposals of BLRI were reviewed in August, 2012. A coordination meeting was held on 26 December 2012 in Livestock Division, BARC on two SPGR projects entitled, "A coordinated project on the surveillance of important infectious, Zoonotic and Emerging Diseases of Livestock and poultry in Bangladesh", and "Development of an effective PPR vaccine seed from local isolate and its molecular characterization". As a member of Technical Committee of BLRI, attended the committee meeting in February, 2013 to review the progresses of on-going research projects and to evaluate & approve new project proposals of BLRI. Monthly, quarterly, half yearly and annual progress reports of nine NATP-SPGR projects of BLRI, BAU, CVASU and BARC submitted in 2012-13 were evaluated.

Support to Avian Influenza/Bird Flue Prevention and Control Programs: As a member of the National Avian Influenza Technical Committee under the Ministry of Fisheries and Livestock, suggestions and technical support were given directly by the Livestock Division of BARC. As a member of different committees of Avian Influenza Preparedness and Response Project of DLS, all sorts of supports were also given by the division to operate the project activities.

Support to Scientists/Officers Recruitment and Research of BLRI: As a member of the recruitment committee for recruitment of scientists/officers of BLRI, support was given directly by the Livestock Division to recruit best scientists/officers for BLRI. As a member of the technical committee and Expert Committee, support was given directly by the division through evaluation of the progresses of different approved research projects and approval of new project proposals of BLRI.

Support to National Agricultural Technology Project: Phase-1, DLS Part: As a member of different committees of the project, support was given to operate the different project activities throughout the year.

Support to Policy Making Programs Related to Livestock: As a member of the expert committee, support was given directly by the Livestock Division in policy making programs related to livestock in the

Ministry of Fisheries and Livestock, DLS, BLRI and other organizations. Support was also given by the division in policy making activities related to livestock through organizing workshop/seminar/ meeting.

Support to MIS/ICT Programs: As a member of the committee for BARC MIS/ICT cell, support was given through review of MIS/ICT's status in different NARS institutes including BARC through meetings/seminar/workshop organized by Computer and GIS unit of BAR C. Support was given to develop MIS/ICT programs in different NARS institutes including BARC.

Routine Functions

The division performed several other routine activities like Annual progress evaluation of the research projects; Preparation of annual report, annual work plan and various other documents, etc.; Review of different documents and preparation of comments on them.
Dissemination of technical knowledge as a resource speaker in seminars and training programs and rendering technical support to various organizations and agencies as an expert member and resource person: Technical knowledge was disseminated as a resource person/expert in worshops/seminars /meetings organized by DLS/BLRI/MOFL/KGF/ CVASU,

Providing technical support to other divisions of BARC and different national and international organizations like BAU, CVASU, SAU, SAC, FAO, ILRI, etc. Technical support was given as a member of National Steering Committee of the BAU part of the UNEP-GEF-ILRI Asia Project on "Development and Application of Decision Support Tools to Conserve and Sustain ably Use Genetic Diversity in Indigenous Livestock and Wild Relatives" to operate the project activities in Bangladesh.

Sub-projects implemented under SPGR, PIU-BARC, NATP Phase-1 were monitored during February 11 to 12, 2013 and May 15, 2013. Divisional SPGR sub-projects were also monitored during October 3-6 and 18-20, 2012, January 2-4, 8 and 16-18, 2013, March 31 to April 2, 2013, and June 11-13, 2013, Core research/Technology transfer activities under Research Grant of BARC were monitored during June 6-8, 2013.

FISHERIES

Project development and financing: The Fisheries Division of BARC supported a number of research activities, workshops, seminars and training programs to enhance regular activities in the field of fisheries research and development. The division reviewed and monitored different research projects of Bangladesh Fisheries Research Institute (BFRI), Bangladesh Agricultural University (BAU), Sher-e-Bangla Agricultural University (SAU), Dhaka University (DU) and Sylhet Agricultural University (SAU) and Sher-e-Bangla Agricultural University (SAU) during the reporting period.The funding sources were revenue and SPGR, NATP Phase I. A total of 09 projects were funded during the reporting period. Among those, five projects were funded under the regular revenue budget and the remaining four projects were funded from SPGR, NATP Phase I.

SPGR Research Projects

Sl. #	Name of the project	Coordinator/ PI	Implementing organization
01	Gene Banking of Improved Broodstocks of Indian Major carps (Catla, Rohu and Mrigal) and Development of Breeding Technique of Three Threatened species (Mohashol, Bagair and Baim), BAU	Professor Dr. Md. Fazlul Awal Mollah	Bangladesh Agricultural University
02	Assessment of Aquatic Pollution and Biodiversity of some Lakes of Dhaka City	Prof. Dr. NiamulNaser	Dhaka University
03	Investigation into fish diseases and economic losses due to disease incidence	Dr. Naznin Begum	BFRI
04	Coordinated project on addressing climate change on fisheries sector through community based technology identification and adoption in the fragile aqua ecosystems of Bangladesh	Dr. KabirIkramulHaque, Professor Gazi M.A. Jalil& Dr. Azimuddin	BARC, SAU & BFRI

Core funded projects of BARC

Sl. #	Name of the project	Coordinator/ PI	Implementing organization
01	Reproductive biology of cuche fish		Bangladesh Agricultural University (BAU)
02	Production of supper male tilapia		BAU
03	Breeding and fry rearing techniques of Tengra and Gulsha		BAU
04	Fish disease and health management in rural aquaculture		BAU
05	Development of artificial breeding techniques of *Sperataaor*	Dr. Mohammed Mahbub Iqbal	SylhetAgricultural University (SAU)

National policy guidelines: As expert member of the national team and member of the working group the scientists of the Division contributed to a number of policy level documents namely-National Agriculture Extension Policy, Fish Products (Inspection and Quality Control) Ordinance (Amendment), Safe Food Act 2013 during the period.

Governing Body Member of SAARC Agriculture Center

The Member Director (Fisheries) is a member of the Governing Body of the SAARC Agriculture Center. As the GB member, he has been participating in different planning and decision making activities of the SAC.

Technical committee member of BFRI

The Member Director (Fisheries) is a member of the Technical Committee, the highest authority of the Institute for approval of the research activities to be implemented under revenue and development fund. The meeting of the technical committee was held at BARC conference room. The research projects for the year 2012-2013 were discussed in the meeting. Among others, the senior Officials of the Ministry of Fisheries and Livestock, Planning Commission, IMED, Professors from Universities, senior scientists of the institute were participated in the meeting.

Member of executive committee of Bangladesh Fisheries Research Forum (BFRF)

BFRF, as an independent organization of fisheries professionals including scientists, researchers, policy makers, private entrepreneurs, extension officials of universities, government and non-government organizations working for fisheries research and development since 2004. The scientist of the Division, as Joint Secretary of the executive committee, voluntarily contributed through identifying and scrutinizing the researchable issues, field and desk monitoring of the activities. In delivering the activities, scientists regularly maintaining liaison with the organization and participated in the technical, as well as executive committee meetings of BFRF. During the reporting period BFRF has conducted a bi-annual conference at BARC auditorium. This conference was presided over by the Honorable State Minister, Ministry of Fisheries and Livestock in presence ofthe Secretary, Ministry of Fisheries and Livestock.

Technical committee member of SPGR (NATP)

The technical committee of SPGR plays an important role in approval process of SPGR Sub-projects.The Member Director (Fisheries) as an active member of the committee recommended different research sub-projects to be undertaken under the project.

Research and financial management and coordination: Coordination among other NARS institutes, Universities and major extension agency, the Department of Fisheries through planning and participating in various activities related to fisheries research, development and extensions were intensified manifolds during the period. The Division regularly participated in the planning process of research projects of the BARC, BFRI, SPGR, NATP and KGF. A number of research projects were placed and discussed in various forums and finally approved for implementation during the period. The Division also assisted and guided the activities of Bangladesh Fisheries Research Forum (BFRF) and WorldFish Center in the planning process of their research activities. Participated in DoF, WorldFish Centre, FAO, GIZ, DFID, different Universities and BFRF activities. Contributed in formulation of DPP for GIZ and USAID.

Monitoring, reviewing and evaluation report of programs/activities of NARS institutes: Review, monitoring and evaluation of the ongoing research activities of BFRI are regularly carried out during the period. In addition, intensive field visit was carried out jointly with Officials and Scientist of DoF/BFRI in various locations of the country and monitored the progress of activities implemented under core research projects as well as projects funded under the SPGR, NATP Phase I those listed above. Supervision and monitoring were done during the period to ensure progress and timely completion of these projects. Almost all the projects were implemented and managed according to the set agenda and achieved notable results.

Highlights of Research Achievements of BFRI

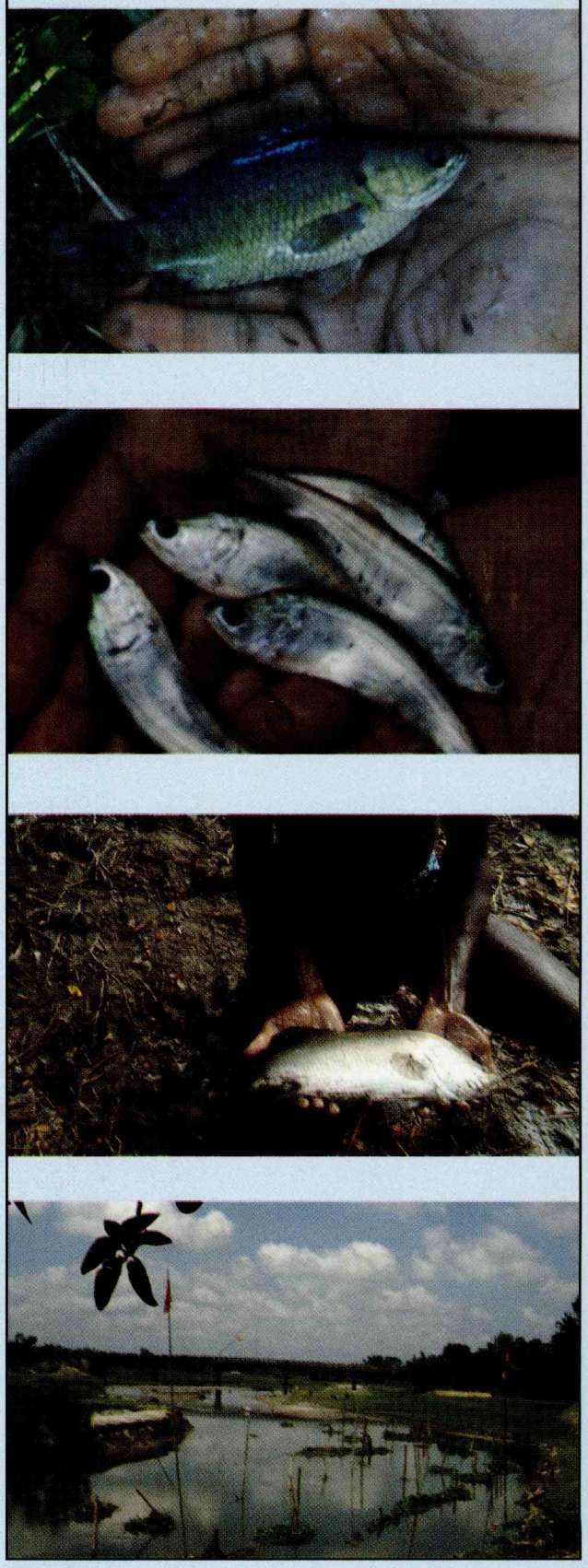
Genetically upgraded rohu (*Labeo rohita*) and silver barb (*Barbodes gonionotus*) are performed higher ($p<0.05$) growth achievement at 16% and 36% compared to local existing stocks. Improved germplasm of these carps were distributed in satellite stations of BFRI, DoF and selected hatcheries.

Similarly, upgraded GIFT showed 35.38% higher growth than that of the founder stock and about 1.5 million fry of GIFT was produced in BFRI hatchery for distribution in satellite stations of BFRI, DoF and selected hatcheries. On the other hand, brood stock replacement techniques protocol was applied to produce F-3 generation of Thai koi (*Anabas testudineus*), showed 12% higher growth over founder stock. In line with conservation of endangered endemic fish species, scientist succeeded in induced breeding of chital (*Notopterus chitala*). In addition, natural breeding cuchia (*Monopterus cuchia*) has been achieved in pond condition. Growth of native *M. cuchia* was observed better than exotic *M. albus*. Development of aquaponic system as a new aquaculture technique in Bangladesh was initiated to maximize fish production with vegetables.

Comparative percentage of spent hilsa (33.69%) observed in the spawning areas which were found 67% higher than based on the year 2003 (0.5%) indicating successful breeding of hilsa in the spawning grounds. No change of spawning grounds, indicating positive impact of 11 days fishing ban following HMAP (Hilsa Management Action Plan) suggested by BFRI.Under a bio-monitoring program of 3 rivers (Padma, Meghna, Dakatia), 10 physical and 9 chemical parameters were studied. The values showed seasonal fluctuation and the deviations from the expectable range indicating the gradual fading of the freshness of rivers. The presence of toxic ammonia and lower amount of dissolve oxygen in some spots gives the glimpse of river pollution. On the other hand, 12 types of fish net, 2 types of fish trap and 2 types of hook line are identified with their characteristics under diversity of adaptive fishing gears and their impact on riverine fisheries program.

Marine research on seasonal abundance of sharks revealed that shark harvesting gains momentum in October-December period and peaks during January-March, while catch gradually falls after that (April-June) with lowest catches during July-September. Moreover, dog shark was the dominant one while hammerhead and milk sharks followed it among the sharks. Whale shark, bull shark and saw-shark are caught in bigger sizes. Percentage of size abundance revealed that sharks are mostly caught at small sizes (>30 cm) while skates and rays were caught at bigger (>50 cm) sizes. With the aim to produce and storage quality dried fish product, it was found that, texture was firm and flexible and odor was very natural in case of silver pomfret or rupchandasutkifor 4 months and 3 months of ribbon fish or churisutkiinglass jar, thick polythene and in plastic containers. Dry fish color started change from light brown to brown after 5 months in case of silver pomfret and bright silver to grey after 4 months in case of ribbon fish.

Koi fish, Dimla, Chital fingerlings, Harvested Vetki and Fish Sancturay in the project areas



Tilapia hapa breeding, Kalapara.

Transferable technology (Highlights of technology released during the reporting period:

During the period of 2012-2013, the BARC, under its research grants provision and SPGR NATP funding, supported 09 research projects as listed above. Most of the research projects are ongoing and were initiated before 1-3 years ago and continued over the reporting period. During this period the project activities generated various information, However, none of these technologies have been released. It is anticipated that about 8-10 technologies will be ready for releasing.

Research Highlights of Important Research Projects

Gene banking of improved broodstocks of Indian Major Carps (catla, rohu and mrigal) and development of breeding technique of three threatened species (mohashol, bagair and baim): Objectives: i) Improved broodstock development through selective breeding andlive and cryogenic gene banking of IMCs, ii) Domestication and breeding technique development and conservation of three threatened species (mohashol, bagair and baim) Seeds from 9 sources (3 riverine sources viz. Halda, Padma & Jamuna and 6 hatcheries of three regions viz. Mymensingh, Comilla & Jessore) were stocked in separate ponds (2 dec. each) and their growth (length and weight) monitored for 6 months. Catla of Halda (190.55±15.64g) and Jamuna (191.79±15.22g) showed similar growth performance but significantly higher than Padma and hatchery sources.Growth of Haldarohu (119.85±18.57g) was significantly ($P<0.05$) higher than Jamuna, Padma and hatchery sources. Haldamrigal showed significantly ($P<0.05$) higher growth (121.07±15.29g) than Jamuna, Padma and hatchery sources.Genetic characterization of three species through allozyme electrophoresis and geneticcharacterization of rohu through microsatellite DNA marker have been completed.Riverine populations contained better genetic quality than hatchery populations. Cryopreservation protocols for rohu and mrigal spermatozoa were developed. Selective breeding of rohu and mrigalwas completed. Collection and domestication of threatened species (mohashol, bagair and baim) were done properly. Breeding seasons of mohashol and baim have been identifiedthrough histological observation. Four induced breeding trials of baim were conducted using different doses of carp pituitary gland (PG) extract. Breeding trials were given using doses ranging from 35-100 mg/kg body weight of female and 5-10 mg/kg body weight of male.In each trial, the first dose (30 %) and the second dose (70 %) for female were administered six hours apart. On the other hand, males in all treatments were treated once at the time of 2nd injection of the female. PG dose of 35 &40mg/kg body weight precipitated ovulation butbest result was obtained from 40 mg/kg body weight in respect of ovulation of females, fertilization and hatching of eggs.

Development of artificial breeding techniques of *Sperataaor:* Duration: 3 Years. From: July 2011 to June 2014, Total cost Tk. 12,00,000. Objectives: Understand the breeding biology of *S. aor;* assess their reproductive potential in captive condition; and develop artificial breeding techniques

Sl.	Planned Activities	Implementation Progress up to till date
1.	Gonad development	Early and developing stages oocytes were mostly observed during March-April and maturing oocytes in May. Presence of oocytes of all developmental stages in a single ovary indicated that *S. aor*possess a group asynchronous ovary. On the other hand, spermatozoa (SZ) in the sperm duct (SD) was observed in May; sperm duct became thicker or fuller due to the spermatozoa and fluids in them indicated that *S. aor* testes became mature in May. But the presence of numerous spermatocytes and spermatogonia in the testes during this time indicated that the egg fertilization can be performed for long time duration.
2.	Gonado somatic index	The GSI of female was found to be gradually increasing from January and the highest value was recorded in June. It was then declined sharply in July-August from where it was again increasing till October.
3.	Fecundity estimation	The average absolute fecundity was calculated 40952/kg fish.
4.	Nest building	We have found various sizes of nests on the bottom of the ponds. Average diameter and depth of nest was found 215.01 cm and 13.27 cm, respectively.

5.	Appearance change	It was found that only the male produce extra ordinary fluid on their body surface during their breeding season. The role of these fluids is yet to be known.
6.	Natural breeding	Natural breeding of *S. aor* was found in the experimental ponds. Fries were found from all ponds having artificial holes in May. But there was not any evidence of fries in the ponds with no artificial holes at the same time.
7.	Maturity enhancement	Certain dose of pituitary extract (PG)was injected to promote their gonadal development and ovulation effectively in July, 2013. But yet not succeed their ovulation effectively.

Coordinated Sub-project on addressing climate change on fisheries sector through community based technology identification and adoption in the fragile aqua ecosystems of Bangladesh

Objectives: i) Identify climate change related major vulnerable issues of fishers' and small aquaculture communities, ii) Strengthen local community coping capacity through developing community based aquaculture/fisheries technology management plan, iii) Pilot the identified technology options within the targeted communities, iv) Develop guidelines for fisheries/aquaculture management framework in context to climate change adaptation in similar communities

Components: Bangladesh Agricultural Research Council, Sher-e-Bangla Agricultural University, Bangladesh Fisheries Research Institute

Implementation Locations: This project is working in two upazila, namely, Amtali of Barguna district and Kalapara of Patuakhali district in the Southern coast of Bangladesh.

Major Activities

Trials on five technologies are on- going. These are-

Technology		Dimla	Gongachara	Amtali	Kalapara
Cage aquaculture	# of cages	75	90	75	81
	# of farmers	25	30	25	28
Tilapia hapa breeding	# of hapa	15	15	20	22
	# of farmers	5	5	10	11
Koi culture	# of farmers	16			
Shingi culture	# of farmers	14			
Chital poly-culture	# of farmers			10	
Sea bass poly-culture	# of farmers				15
Crab fattening	# of farmers			5	20
Rice-fish culture	# of farmers				10
Fish sanctuary	# of farmers		168	150	
Community based fisheries management	# of farmers		193		

Conducted regional workshops of BFRI at Freshwater Fisheries Research, Mymenshing, Brackishwater Fisheries Research, Paikgacha, Riverine Fisheries Research, Chandpur, and Marine Fisheries & technology station, Cox's Bazar.

NATURAL RESOURCES MANAGEMENT

Forestry

Review of Forestry Research Programme

Research programme of Bangladesh Forest Research Institute and other organizations involved in forestry and agroforestry research and development have been reviewed and necessary guidelines have been provided. It was observed that BFRI took about 76 research programmes BFRI was suggested to undertake research programme in future to cater to the needs of the end-users. Similarly, agroforestry activities of BFRI, IFESCU, Khulna University, BAU, SAU, BSMRAU, BARI, BJRI, CDB and other organizations were reviewed and a national programme was developed.

BFRI was also suggested to take research Programme through bottom up approach. They were asked to organize Research Programme Review Workshop with the stakeholders and involving the related organizations at Regional level. Research Programme

should be initiated at the regional level like other Research organizations. The research programme should be discussed also in the Central Review Workshop and finally approved in the Task-force meeting.

NAWG Meeting

Organized a programme planning meeting of NAWG to develop agroforestry system in Bangladesh on 02 January 2013 and discussed the problems and prospects of agroforestry.

Coordinated World Food Day Seminar

Coordinated World Food Day Seminar was held on 16 October 2012 at BARC auditorium, Farmgate, Dhaka. The Seminar was presided by Secretary, Ministry of Agriculture Mr. Monjur Hossain, Honorable Agriculture Minister Motia Chowdhury, MP was the Chief Guest. The theme of seminar was "Agricultural Cooperatives- Key to Feeding the World".

Participation as Focal Point/Member

- Advisory committee meeting and in the expert Committee meeting of Research programme of Bangladesh Forest research institute.
- National Disaster Management advisory committee.
- Food and agricultural committee meeting of BSTI.
- Technical committee meeting of BSTI.
- Technical committee meeting of MoEF.
- WARPO
- Department of Environment.
- Department of Forest.

Activities of the NATP-SPGR Coordinated Sub Project on Agroforestry Practices for better livelihood and Environment

KU: Khulna University is promoting Agroforestry (AF) along the gher dikes in Dumuria of Khulna district and Kaliganj of Satkhira district.

In Dumuria Upaziala the farmers have planted mahogany, akashmoni, *Albizia*, etc., in the dikes that are usually remain vacant. Under the plants, are grown different vegetables like tomato, ladies finger, Indian spinach, beans, bottle gourd, yam, arum, etc. The farmers view that gher dikes with agroforestry intervention by KU have already started giving large economic benefits to them. According to the farmers, the trees pose no harm to fish rearing. At kaliganj which is saline prone area the farmers are confused if there can be vegetation at all. There are some old plantations on the dikes. When cited the existence of such plants, they appeared to somewhat agree that trees in the dikes may not be harmful. With this confidence, the farmers have come forward to the plantation programme in the dikes. To this end, new plantation has been done. The tree species are mahogany, mango, guava, jujube, neem, coconut, betel nut, lemon, etc.

BSMRAU: BSMRAU activities are concentrated in three upazilas in Narsingdi district, one upazila in Gazipur district and one upazila in Khulna district. In Narsingdi and Gazipur districts Agroforestry practice is done mostly under jackfruit trees. There are forest trees as well in the periphery of the orchards in some cases. There are new plantations of litchi and malta in many cases. The associated crops are papaya, cucumber, brinjal, lemon, etc. According to the farmers a good return is coming from the Agroforestry practice. In Khulna district the tree species are mango, jujube, etc. Various vegetables such as ladies finger, arum, raised gourd, sponge gourd, cucumber, etc, are successfully grows inter-space fetching a sizeable income to the farmers. Thus, intercropping in mango and jujube plantation is a successful activity. Tall trees like mahogany, coconut, betel nut, etc., in the boundaries of the farm land even do not interfere in production of the intercrops. These inter space was previously remained vacant.

BAU: BAU initiative consists of agroforestry practices in fruit tree orchard, plantation in cropland boundaries and forest tree with agricultural crops combinations. The activities are being done at Char Kalibari, Char Gobadia in Mymensingh district and Topkar Char and Ghose para in Jamalpur district. In the former case, agroforestry practices along the land in the river side, crop land and homesteads are promoted. The farmers are getting additional harvests from growing vegetables. In the later case, plantations in crop land boundaries in homesteads are encouraged. Initially the farmers did not take the activities positively. Now they find that the initiative is beneficial to them.

BJRI: BJRI activities concentrate growing late jute seeds in agroforestry practice. Most of the sites in Faridpur region were still water-logged till the 3rd week of September. The plots selected for growing of jute seed are arable lands that are planted with mango, litchi or mahogany. The plantations are of 1-3 years old. Mango and litchi have been planted with wide spacing, and may be suitable for under-planting. But forest tree species like mahogany are closely planted. As such it may be suitable for under-planting up to 4-5 years of age of the forest tree species.

BFRI: BFRI has come up with satisfactory results in its activities in growing medicinal plants in the experimental plots in Bandarban, Rangamati and Khagrachari Hill districts. It has also made a linkage of the relevant farmers to sell their produce to a medicinal company.

IFESCU: IFESCU is working with the tribal people in Kaptai upazila to promote AF through community mobilization. To this end, 3 communities have been formed with the people in villages. However, IFESCU should gear up its activities.

Participation

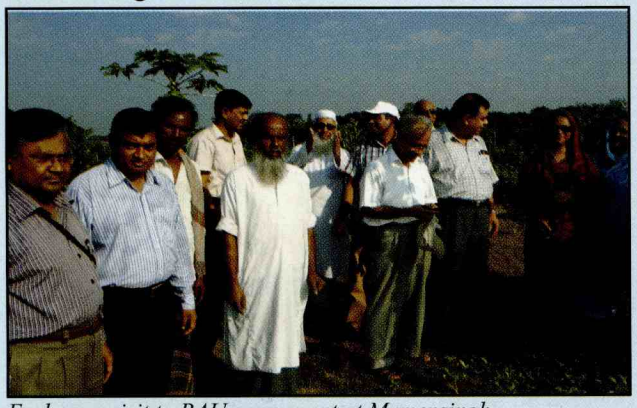
A number of workshop, seminars conferences, symposia and technical meetings were held during the reporting periods. Contributions were made in the form of paper presentation, as reporter of technical sessions and report presentations, facilitator in the working group; interactions were made as the active participants. Some important programmes, attended are listed below:

Participated in the following Training/Workshop/Seminar during 2012-2013

Sl. No.	Organization/Venue	Year	Name of Programme
1	Shefali Conference Room, Poribesh Bhaban, Ministry of Environment	27 Jul 2012	Male Declaration on Control and Prevention of Air Pollution and Its likely Transboundry Effects for south Asia
2.	BFRI Auditorium, BFRI	12 Jul 2012	Advisory Committee meeting
3.	Conference Room Chamilly, Poribesh Bhaban, Ministry of Environment	14 Oct 2012	4th National Advisory Committee (NAC) Meeting at Department of Environment
4.	Conference Room Chamilly, Poribesh Bhaban	14 Nov 2012	5th UNCED Reporting meeting
5.	BARC and BSMRAU, BRAC Centre, Mohakhali	30-31 Jan'13	Consultative Workshop on ICRAF's Capacity Development Strategy and South Asian Partners' Capacity Needs Assessment
6.	Conference Room Chamilly, Poribesh Bhaban, Ministry of Environment	25 Mar 2013	5th National Advisory Committee (NAC) meeting of DoE
7.	BFRI Committee Room, BFRI, Chittagong	26 May '13	Technical Committee meeting
8.	BJRI Committee Room, BJRI, Dhaka	4 Jun 2013	Internal Research Review Workshop of BJRI as an expert member

Organized an Exchange Visit Programme

An Exchange visit programme was organized throughout the country on SPGR-NATP programme. All PI and Co-PIs visited all the experimental sites and exchange their ideas and views.



Exchange visit to BAU component at Mymensingh

Visit of Executive Chairman

Executive Chairman of BARC visited different experimental sites such as SPGR Agroforestry Subproject activities at Norsingdi and Rangamati. He visited Regional Horticultural Centre of BARI, at Shibpur, Norsingdi and Bangladesh Forestry Research institute, Chittagong. He also inaugurated "Propagation Chamber" at BFRI, Chittagong.

BARC Executive Chairman visits BFRI and IFESCU

Field Visits, Review, Monitoring and Evaluation

Review, monitoring and evaluation of on going research activities of Bangladesh Forest Research Institute are regularly carried out by the Forestry

Wing, BARC. Intensive field visit was carried out jointly with official and Scientist of DAE/NARS and NGOs in various locations of the country for technology selection, monitoring & evaluation. Forestry and agroforestry activities at Khulna University, Chittagong University, BFRI Chittagong, BAU Mymensing, BSMRAU, Gazipur, Khulna University and BJRI, to Monitor the NATP-SPGR Coordinated sub project on *Improvement of Agroforestry Practices for Better Livelihood and Environment-BARC Component* and *Enrichment and conservation of Mangrove Ecosystem* SPGR subproject of NATP established at sundarban was monitored. Also BARI, Khulna was visited and monitored.

Agricultural Engineering

The unit has the responsibility of research management in the three distinct areas under agricultural Engineering, namely, Farm Machinery, Irrigation and Water Management and Post Harvest Processing Engineering. The unit oversees the major program being undertaken by the NARS institutes for the purpose of further improvement.

View of Training programme in BARI Gazipur

Policy Level Contribution

Different policy oriented comments were prepared for appropriate steps on emerging problems and prospective issues in the field of Agricultural Engineering and other related fields. All comments were submitted to the Ministry of Agriculture as per their request through EC, BARC. Some of the activities are given below:

- UN Convention on the Law of the Non-navigational uses of International Watercourses, 1997
- Investment of financial and credit facilities for Mechanization of Agriculture in Bangladesh by The Chery Heavy Industry Co. Ltd.
- Industrial development and Invention Act 2012
- National Oceanographic Research Institute (NORI) Act 2012
- New Domain Name for the Centre for Sustainable Agricultural Mechanization (CSAM), UNAPCAM

Monitoring and evaluation of Research Program of the NARS Institutes, SPGR- BARC Sub-projects and projects of other institute

1. Involved in monitoring of Research Program of the NARS Institutes and other Institutes funded by SPGR, BARC.
2. Evaluated monthly, quarterly, half yearly, annual report and revised budget for extended period of ten SPGR funded project.
3. Evaluated Bangladesh Academy of Sciences project on 'Zero Energy Storage'.

Linkage

Maintained strong Linkage with the engineering professional bodies in home and abroad like CIMMYT, IRRI, IEB, BWDB, CSAM (Before it was UNAPCAEM), WARPO, BSTI, NGOs, IDE, BWP /GWP, BAS, FAO and Universities etc.

Worked as Member in the Different Committee

1. Draft minor irrigation rules preparation formed by MoA.
2. Recruitment committee of BSRI and BLRI.
3. Feasibility Study and Detailed Engineering for Ganges Barrage Project, BWDB, Dhaka - member of Technical committee.
4. Off take management of the Gorai River Project, BWDB - PEC member
5. National Water Resources Database and Integrated Coastal Resources Database activity in WARPO – Focal point from BARC
6. Overcoming Agronomic and Mechanization Constraints to Development and Adoption of Conservation Agriculture in Diversified Rice-based Cropping in Bangladesh (LWR-2010-080) project funded by Australian Centre for International Agricultural Research - Acting as coordinating member and integral member of BARC for PhD student selection committee of the project.

Highlights of R&D of the NARS Institutes

1.1 Farm Machinery

Development and performance evaluation of an axial flow pump: An axial flow pump was designed and fabricated at Farm Machinery and Postharvest Process Engineering Division, Bangladesh Agricultural Research Institute, Gazipur during 2012-

13. The preliminary test was conducted for surface water lifting at 1.50 m vertical lift. Average engine speed (rpm), pump speed (rpm) and discharge of the pump at 1.50 m vertical lift were 1823 rpm, 1989 rpm and 25.43 l/s, respectively. The preliminary test result seems to be encouraging. This experiment will be continued to the next year for improvement of the pump for its better performance.

Design and development of a power tiller operated multi-row weeder for wheat: A power tiller operated multi-row weeder was designed and fabricated in Farm Machinery and Postharvest Process Engineering Divisional workshop, BARI, Gazipur in 2012-13 for weeding of wheat and other narrow row crops. The weeder has 6 numbers of shovel type blades. The distance between the blades was 20 cm and the depth of weeding is adjustable up to 5 cm. The weeder was tested in experimental plots of Regional Wheat Research Center, Gazipur and FMPE Divisional field. Time required for weeding was found 17.86 and 55.75 hr/ha for power tiller operated weeder and BARI dry land weeder, respectively. Performance of the weeder in wheat field was not good. Improvement is required for proper functioning of the weeder.

Design and development of an onion stem cutter: An onion stem cutter was designed and fabricated in Farm Machinery and Postharvest Process Engineering (FMPE) Division of Bangladesh Agricultural Research Institute (BARI) during 2012-13. The stem cutter is made with locally available materials and operated with a 0.37 kW electric motors. Important parts of the machine are feeding table, conveyor, cutter and outlet. Capacity of the stem cutter is 55 kg/h for dried garlic.

Field performance study of combine harvester available in farmers' field: Data were collected from The Metal Private Limited, ACI Motors and Corona Tractors Limited through structured questionnaire, andn from 30 adoptor and 30 non-adoptor farmers from each district of Bogra, Rangpur, Dinajpur and Thakurgaon. The Metal Private Limited is marketing new CLAAS (India) combine suitable for both rice and wheat harvesting. ACI Motors and Corona Tractors Limited are marketing new and refresh Daedong and Kukje combine (South Korea) which is suitable for both dry and wet land rice harvesting. There are problems of frequent mechanical disturbances and shattering loss of refresh Daedong and Kukje combines. CLASS model combine harvester is liked by the farmers for its high capacity and less mechanical problems. Average harvesting charge of combine harvestor (11500 Tk/ha) was less than the manual harvesting, threshing and winnowing costs (15631Tk/ha). The benefit cost ratio (BCR) and pay back period of a new combine harvestor (CLASS) are found to be 2.47, and 2.0 years, respectively. There is tremendous demand of combine harvestor for rice and wheat at custom hire basis.

Field performance evaluation of BARI USG applicator: Field performance of BARI USG applicator was evaluated in Gazipur, Pabna, and Barisal during the boro season of 2012-13. The applicator was tested with four treatments-application of USG by hand (165 kg/ha), application of USG by BARI USG applicator (165 kg/ha), application of prilled urea at USG rate (165 kg/ha) and application of prilled urea at farmers practice. Similar yield of rice was obtained from machine and hand application of USG in all locations. Higher yield of rice was obtained from USG than granular urea. During field test, average capacity and efficiency of the applicator were 0.138 ha/h and 81%, respectively. Considering custom hiring, the net income per year was Tk 75000 and the payback period was 3 days. The price of the applicator is Tk 3500.

Field performance evaluation of BARI inclined plate planter: Field test of BARI inclined plate planter was conducted in Gazipur, Pabna, and Barisal and its field performance was evaluated. The planter was tested for sowing maize, wheat and mungbean during 2012-13. Field efficiency of the planter was 75% and the field capacity was 0.12 ha/h. Coefficient of seed distribution uniformity and coefficient of planting depth uniformity were 97% and 94%, respectively. The experiment was conducted with four treatments: bed planting with inclined plate, inclined plate planter with full tillage, inclined plate planters with strip tillage and conventional hand planting. Inclined plate metering device was incorporated in bed planter showed better performance than others methods. But power tiller operated inclined plate planter reduced planting time as it covered double area than the bed planter. The use of the inclined plate planter would reduce the cost of land preparation and planting by 77%. The payback period of the planter is 0.75 year. Field demonstrations and trainings are needed for adoption of this technology in the farmer's field.

Fine tuning of power tiller operated bed planter: The bed planter functional components were fine tuned and improved with the introduction of larger size engine pulley of fly wheel. The size of pulley was 8.5". Power transmission chain of the bed planter was divided into two parts avoiding shaking of chain

during overcome land boundary (aiel). The bed planter formed a trapezoidal shape raised bed and can perform seeding and fertilizing operations on the top of the bed simultaneously in one operation. The bed planter is to be attached behind the power tiller (these are readily available in Bangladesh with reports of up to 4,50,000 within the country). The seeding quality of the planter has been improved with the introduction of inclined plate seed meter for seeding wheat, maize, rice, pulses and other small seeds. The bed planter also further improved with introduction of fertilizer box and roller type bed former. The implement comprises of four major components, namely- rotary tilling part, furrow opener, seeding unit with metering mechanism and bed shaper. Performance of the implement was tested for wheat, maize, mungbean and rice cultivation. The uniformity of maize seed spacing was 86-95%. The density of rice and wheat residue were 1.8 t/ha and 1.6 t/ha in the tested plot, respectively when seeding on permanent bed. After initially forming the bed, an additional advantage was that reshaped bed can be used for next crop without any further tillage operation keeping it permanent. Fresh bed saved 21.5% and permanent bed saved 34.1% irrigation water. Water logging problem can be avoided introducing bed planting system, especially in rainy season crops.

Development of suitable package for transportation of pineapple: A corrugated fibre board package was designed in Farm Machinery and Post-harvest Process Engineering Division, BARI, Gazipur in 2013 for packaging and transportation of honey queen pineapple. The load bearing capacity of the CFB (50x30x20 cm for hoding 10 kg) package was 70 kg. The fruits were packed in different packaging materials viz. bamboo basket, corrugated fibre board, and plastic crate. Matured pineapple was purchased, sorted and packed in different packages from Khagrachuri and transported to BARI Gazipur by a pickup van. Then the pineapple packages were opened in FMPE Division, BARI, Gazipur at ambient temperature (29 ± 2°C) and humidity (79± 2%). The lowest deacy(11.00%) and weight loss(0%) of pineapple was found in bamboo basket and wrapping with 2% perforated polyethylene (0.05 mm) and packed in CFB, respectively. Plastic crate should be used for local market to transport the fruits. Packaing cost of CFB was higher than plastic crate and bamboo basket.Corrugated fibre board may be used for export market or supper market.

Development of suitable package for transportation of banana: A study was conducted to develop suitable package of banana. Sabri Kola was used for conducting the study. The experiments were conducted in July 2013 at the Farm Machinery and Post-harvest Process Engineering Division, Bangladesh Agricultural Research Institute, Gazipur. Overall dimensions of the designed corrugated fibre board (CFB) package were 40x32x30.5 cm and ply number was 7 ply. The static bearing load capacity was found to be 80 kg. The holding capacity of the CFB carton was 10-12 kg of banana. The polyethylene bags of 0.05 mm thick having 2.0% perforation was used to pack the bananas fruits. Plastic crate was tested to be better packaging material to transport the bananas at local market against corrugated fibre board (CFB) in consideration of economic profitability. No weight loss and injury was observed in CFB packages. It may be used for export and market.

Enhancement of shelf-life of papaya through pre-treatments: After harvesting, papaya is infected by post-harvest disease caused by some fungi. The quality and quantity losses of papaya occur due to disease attacks and lack of proper post-harvest handling. Fungus can be destroyed or made inactive by chemical or heat treatment. Most of the chemicals are hazardous for human health. Heat treatment technology is simple and is a non-chemical method to kill or inactivate pest and to control fungus. The matured papayas were treated by hot water at different combination of exposure times and temperatures. The effective combinations of temperatures and exposure periods of papaya were found to be 52°C for 35 minutes with 4% calcium chloride. When the papaya fruits were treated with hot water, the shelf-life of the fruits were found to be increased by 40% and the post-harvest loss reduced by 16% over untreated fruit.

Development and adaptation of solar pump irrigation system under eco-friendly environment: Five solar pumps were tested at different times in the four project sites i.e. Gazipur, Barisal, Magura and Jamalpur. In Jamalpur, Magura and Barisal the solar pumps were operated with 1050 W solar panels whereas in Gazipur the pump was operated with 1440 W solar panel equipped with solar auto tracker. In Gazipur and Jamalpur, the solar pumps were used for drip and furrow irrigations for vegetables cultivation. In Barisal and Magura, solar pumps were used for boro rice cultivation. Discharges of submersible pumps in different locations of Bangladesh varied from 75 to 215 l/min. BARI developed solar pump is suitable for surface water lifting and able to lift water from 6.5 m depth. About 44% higher discharge was found from BARI solar pump than submersible solar pump. Water applied for summer tomato by drip

method, winter tomato by furrow and drip methods, brinjal by furrow and drip methods, wheat by furrow method and boro rice by flood methods of irrigations were 147, 610, 335, 460, 238, 430 and 1288 mm, respectively. Yield of drip irrigated tomato (40.53 t/ha) was slightly higher than that of furrow irrigated tomato (38.92 t/ha) but water saved by drip method was 45% than furrow method of irrigation. The yield of drip irrigated brinjal (41.86 t/ha) was slightly higher than furrow irrigated brinjal (38.60 t/ha) but 48% water was saved by drip method over furrow method. For irrigating boro rice and wheat the command areas of solar pump would be 0.44 and 1.36 ha respectively.

Production of biodiesels from jatropa seeds and use in farm engines: Jatropha fruits, planted in the unused land (fencing sides) of Farm Machinery and Postharvest Process Engineering experimental field in 2010-11, were harvested and about 12 kg of seeds were produced during 2012-13. The average length, width, thickness and weight of Jathropha seeds were 17.53 mm, 12.31 mm, 10.14 mm and 0.43 g, respectively. The seeds were expelled in a screw type oil expeller and about 2.5 liter oil was obtained. The density of jatropha oil was found to be 0.87 g/cc and specific gravity was 0.88. Jatropha seed oil content and kernel oil content were found to be 37.28%, 49.50%, respectively. A diesel engine (8 hp) was operated with Jatropha oil at no load condition at 100, 50, 40, 30 and 20% blending ratio. There was no significant difference of carbon mono-oxide (CO) emission among the diesel and jahropha oil and their blendings. The emissions of carbon dioxide (CO_2) and hydrocarbon were the highest from diesel than the jatropha oil and their blendings. Significantly the highest emission of oxygen was found from 100% jatropha oil than diesel and its blendings.

Development of solar dryer for drying of chilli seeds: A solar dryer was fabricated at Spices Research Centre, Bogra for drying of red chilli seeds during 2012-13. A software was developed using Microsoft Excel for designing a solar dryer for drying of 30 kg of red ripe chilli. The average exhaust temperature was about 14°C higher than the ambient temperature. The average exhaust relative humidity was 10% lower than the ambient relative humidity. Time required for drying of 30 kg fresh red ripe chilli in the dryer was 3.50 days (18 hours) of effective sunshine. It took 15 days to dry similar sample in the open sun. Eight kilogram of dried chilli was produced from 30 kg of fresh chilli. The quantity of seeds obtained 2.75 kg from 8 kg dried chilli. There is two upper tray and two lower tray in the chamber. The upper tray seed germination was 76% and the lower tray seed germination was 81%. The germination of open sun dried chilli was 91%. In order to compare with the farmers practice, some seeds were collected from a local farmer and the germination was 71%.

Development and evaluation of direct seeded machine for paddy to suit in Bangladesh condition: A study of direct seeding machines attached to different prime movers was conducted in the field using three prime movers: Chinese power tiller, Korean power tiller and cultivator. The statistical analysis showed that for row-to-row distance, number of plants per hill and number of missing hills per square meter there was no significant difference among the three prime movers, while for hill-to-hill distance there was a significant difference between the prime movers. The fuel consumption was found to be highest for the Korean cultivator (14.0 l/ha) compared to the Chinese (11.2 l/ha) and the Korean (12.0 l/ha) power tiller. The hill-to-hill distance was found to be highest (19.5) for the Chinese power tiller and lowest (17.63) for the Korean cultivator, while it was 18.67 for the Korean power tiller. The number of plants per hill was more (8.43) with the Korean power tiller and less (5.567) with the Chinese power tiller. The seed rate was 44 kg/ha, 36 kg/ha and 40 kg/ha for Korean cultivator, Korean power tiller and Chinese power tiller, respectively. The field capacity of Korean power tiller, Korean cultivator and Chinese power tiller were 0.189, 0.150 and 0.214 ha/hr, respectively. A continuous seed dispensing pattern in ditch was found for the animal-drawn seeder; while the seed dispensed on ground and scattered around hill and row space in a manner that looked like a hand broadcasting type seeding pattern in drum seeder. The combination of a Korean pointed seeder and an attached cultivator was found to be more suitable in all respects as a hill dispensing seeder compared to the combination of Chinese and Korean power tiller with seeder machine attached.

Evaluation of mechanical transplanter in unpuddled transplanting of wet season rice in sandy loam soil: Unpuddled transplanting saved fuel remarkably compared to puddle transplanting. In sandy loam soil, unpuddled field could not provide proper anchorage and gripping force to seedlings resulting higher floating hills. Transplanting time was higher in unpuddled plot than puddled. Mechanical transplanting reduced drudgery of the farmers and ensured timely operation. Floating hill was also higher in unpuddled plot due to increase in soil hardness and unable to provide proper anchorage and gripping force to seedlings. Grain yield of unpuddled transplanting was similar to puddled transplanting.

Water productivity was the lowest in unpuddled than puddled transplanting. Input cost was higher in conventional puddling than unpuddled transplanting. Mechanical transplanting overcome the constraints of manual transplanting in unpuddled condition.

Performance evaluation of mechanical rice transplanter both in puddle and un-puddle condition: A preliminary study was in both puddle and un-puddle conditions in three locations of Kumarkhali, Kushtia; Laksam, Comilla and Burichang, Comilla. Walk behind type 4 rows mechanical rice transplanter was used to conduct the study. Seedling was raised in plastic tray for transplanting. Puddle field was prepared by three tilling and one leveling operation, whereas major weeds of the un-puddle field was removed manually. Mechanical rice transplanter was found suitable to operate in un-puddle condition with some pre-requisite management which is inundation of land for making the soil soft and weed out before transplanting. Row to row distance and plant to plant distance were found uniform. Missing and floating hill was found 1.08, 0.0 and 1.17 aand 2.33 nos/m^2 for puddle and un-puddle conditions respectively. Floating and damage hill per m^2 was 2.33 and 1.83 in un-puddle condition whereas 0.0 and 0.67 in puddle condition respectively. Average filed capacity was found 0.303 and 0.270 ha/hr in puddle and un-puddle conditions respectively. Yield and yield contributing characters have no significant effect in puddle and un-puddle field. Average yield of the BRRIdhan49 was 5.10 and 4.87 t/ha whereas 4.92 and 4.89 t/ha for Binadhan-7 in puddle and un-puddle field respectively. Total benefit of rice production in puddle and un-puddle field using mechanical rice transplanter was found Tk. 34204.0 and Tk. 35683.00 per hector respectively.

Development and evaluation of a power weeder for Bangladesh condition: Five weeding technology were used in the study namely Korean Multi-rows Power weeder (KMPW), Modified Multi-rows power weeder (MMPW), Korean Single rows power weeder (KSPW), BRRI Weeder and Manual weeding. Korean multi-rows power weeder which is suitable for 30cm line transplanted rice filed was modified for 18/20/22 cm line spacing using Auto-CAD engineering tools and fabricated in the divisional research workshop. Modified power weeder was evaluated at BRRI research field and farmer's field at Kumarkhali, Kushtia in comparison with other weeding technology. During study walking speed, time of weeding, time spent for turning at headland, fuel consumption, and number of weeds before and after weeding, number of weeds revive after 3 and 10 days of weeding operation, number of tiller damage, weeding quality and operator comments data were recorded. It was observed that the average field capacity was 1424.97, 894.03, 559.34, 398.40 and 224.90 m^2/hr for KMPW, MMPW, KSPW, BW and Manual weeding respectively. The weeding efficiency was found 86.01, 91.07, 96.23, 77.49 and 86.38 percent in 1st weeding at Gazipur, and 82.38, 81.84, 69.14, 68.51 and 89.25 percent in 2nd weeding at Gazipur whereas 91.98, 90.61, 89.24, 82.12 and 95.02 percent at Kushtia for KMPW, MMPW, KSPW, BW and Manual weeding respectively. The field efficiency 69.54, 69.80, 72.35 and 83.78 percent in 1st weeding and 70.99, 70.62, 68.44 and 85.02 percent in 2nd weeding at Gazipur whereas 61.68, 52.9, 61.75 and 86.12 percent at Kushtia. The cost of operation over traditional method for weeding was found 1746.72, 1507.50, 92.29 and 1585.06 Tk/ha for KMPW, MMPW, KSPW and BW respectively.

Development of agricultural machinery: The imported self-propelled reaper and existing BRRI developed self-propelled reaper were tested in BRRI Regional Station, Rajshahi in Boro 2011-12 and T.aman 2010-11 seasons. During the field operation of the reaper with 1.2 m head, average field capacity of imported reaper were found 0.236 ha/hr (58.29 decimal/hr) and 0.232 ha/hr (57.24 decimal/hr) in Boro 2011-12 and T.aman 2010-11 seasons respectively. On the other hand average field capacity of the existing BRRI developed self-propelled reaper with the same head in Boro 2011-12 and T.aman 2010-11 seasons were found 0.278 ha/hr (68.66 decimal/hr) and 0.267 ha/hr (65.84 decimal/hr) respectively. The average fuel consumption of imported reaper and BRRI developed reaper were 0.827 l/hr and 0.765 l/hr respectively. The purchase price of imported reaper is almost double of BRRI self-propelled reaper. According to the analysis it is clear that the overall performance of the BRRI developed reaper was better than that of imported reaper.

Performance evaluation of press mud for producing biogas: An experiment was conducted on performance evaluation of press mud for producing biogas during the cropping season 2012-13. The main objective was to promote appropriate technological options to recycle the press mud. Primarily fresh press mud was used as raw material with 3 treatments of solid concentration (ie. 5%, 10% and 15% solid diluted in water). This study was laboratory base conducted in batch reactor. It was found that optimum gas was produced at 15% solid concentration and hydraulic retention time was 30 days.

Design and development of sugar beet slicer: An experiment was conducted during the cropping season 2012-13 to design and development of sugar beet slicer for slicing sugar beet. A 3 feet height and 1.5 feet dia cylindrical drum, a blade of rounded sharp rises edge and a variable speed electric motor (1 hp) was used to make the slicer. Performance of beet slicer was satisfactory and the capacity of slicer was 200 kg/h.

A study on smell free and economy jute processing oil (verdure and rafi) for jute spinning industry: Jute fibers of BWC grade was selected as raw material for this experiment. Jute fibers were piled with the application of 20% normal emulsion (Oil-19.5%, Water-80%, emulsifier-0.5%). On the other hand, another same jute fibres were piled with Verdure and JBO mixing emulsion used (JBO-6%, Verdure oil-1.75%, Emulsifier-0.5%, Water-91.75%) and kept for 48 hours for maturation. The entire piled jute fiber will be on breaker card, finisher card, 1st drawing and 2nd drawing machine. All slivers will be processed through 3rd drawing machine and spinning machine to produce 241 tex yarns. Finally the spun yarns will be tested as per standard methods. 241 tex jute yarn were produced with different types of emulsion mixing system through slip draft spinning frame. Textile properties of produced yarn were measured following standard testing method. It was found that yarn quality produced by using conventional emulsion and verdure mixing emulsion was almost same. It was highly remarkable that large quantity JBO was decreased by using verdure oil.

A study on performance of intersecting gilling machine of flax line in traditional spinning system: Jute fibers of BWD grade were selected as raw material for this experiment. Jute fiber was piled with the application of 25% normal emulsion and kept for 48 hours for maturation. The entire piled jute fiber was processed through breaker card, finisher card, 1st drawing and 2nd drawing machine. Then the 2nd drawing slivers were divided into two sections. One section of sliver was processed through 3rd drawing machine and spinning machine to produce 7.5 lbs/spy yarns. Another section of sliver was processed through intersecting gilling machine and spinning machine to produce 7.5 lbs/spy yarn. Sliver of different machines i.e. 3rd drawing and Intersecting machine were observed. Finally the spun yarns were tested as per standard method. From the study yarn produced from two different processes, it was observed that yarn produced from Intersecting gilling machine sliver shows better result. 3rd drawing sliver and Intersecting gilling machine sliver's CV% were 2.86% and 1.06% respectively which indicates the second sliver was more uniform than first one. Textile properties of produced yarn like coefficient of variation (CV%), tensile strength, quality ratio of jute yarn by using Intersecting gilling and conventional Spinning machines provide desired quality of the fine jute yarn. 8.09 lbs/spy jute yarn produced from BWD jute by using 6:1 doubling of intersecting gilling machine (GN4) and spun through Hessian spinning machine and quality ratio was found 90.95%. 8.19 lbs/spy jute yarn produced from the same grade jute by using the 3:1 doubling of traditional 3rd drawing machine and spun through Hessian spinning machine and quality ratio was found 82.36%.

Production of union fabrics of fancy weave design, mockleno and honeycomb using jute yarn as weft and cotton yarn as warp: About 250 meter of Mockleno fabric and 25 meter of Honey comb fabric were woven under this project. The width of the fabric was 70 inches. These are two new types of jute-cotton union fancy fabric. The Mocklno fabric may be used for making car-seat cover, sofa cover etc whereas the Honey comb fabric may be used for making fashionable jute-bags. Tensile strength of the Mockleno fabric in warp way is 49.13 Kg and 138.64 Kg for weft way. In case of Honey comb weave fabric warp way tensile strength is 34.81 Kg which is lesser than Mockleno fabric but for weft way strength of Honey comb weave is 145.15 Kg which is greater than weft way tensile strength of Mockleno fabric. Abrasion resistance of the Mockleno fabric 1757 revolutions to rupture the fabric. Stiffness of the Mockleno fabric is 2.51 cm and 5.92 cm for warp way and weft way respectively. Stiffness of the Honey comb fabric is 2.22 cm for warp way and 5.60 cm for weft way.

1.2 Irrigation and Water Management

Improvement of water holding capacity of light textured soil through addition of solid wastes: An experiment was conducted at Thakurgaon during the cropping season 2011-12 to improve water holding capacity and fertility of light textured soil (loamy sand which contain 87% sand, 12.68% silt and 0.25% clay) through addition of solid wastes (ash and press mud). Experiment was designed RCBD with three replication of ten treatments and crop was selected as sugarcane. Ten treatments were as T_0= Control, T_1=5 t/ ha Ash, T_2=10 t/ha Ash, T_3=15 t/ha Ash, T_4=5 t/ha press mud (PM), T_5=10 t/ha press mud, T_6=15 t/ha press mud, T_7=5 t/ha Ash+PM (1:1), T_8=10 t/ha Ash+PM (1:1), T_9=15 t/ha Ash+PM (1:1). Results of this experiment are shown in table as below. Significant effects on sugarcane yield were obtained

in different treatment combination. The highest yield of 64.16 t/ha was obtained from the treatment T_2 (10 t/ ha of ash) followed by 63 t/ha from the treatment T_4 (5 t/ha of press mud).

Determination of optimum water requirement for promising sugarcane clone under ZYT-III: This experiment was conducted at Bangladesh Sugarcane Research Institute, Ishurdi, Pabna, during the cropping season 2011-12 to find out optimum water requirement for three different sugarcane clones and one variety as well as to determine the response of clones at different stages (five irrigation treatments) to irrigation. Maximum yield was found 114 t/ha at treatment I_2 where irrigation was applied 2 nos. Maximum pol% was found 11.88 at treatment I_4 where irrigation was applied 4 nos. Highest yield, 126 t/ha was found from variety V_4 (Isd 37) and highest Pol % Cane (12.41) was found from clone C_1 (I 39-04).

Determination of optimum water requirement for sugar beet in sugar mill zone: An experiment was conducted at Bangladesh Sugarcane Research Institute, Ishurdi during the cropping season 2012-13 to find out optimum irrigation water requirement based on climatic and soil data for different sugar beet variety. Experiment was designed split plot of six irrigation treatment on the basis of pan evaporation and two varieties with three replications. Highest yield was found 72.39 t/ha at I_3 irrigation **(**Irrigation at 35 mm Panevaporation up to 50 DAS then at 50 mm Panevaporation up to harvest and received 06 number of irrigation**)** on the other hand highest pol% was found 13.58 at irrigation I_4. In case of irrigation-variety interaction effect highest yield was found 82.0 t/ha at I_3 irrigation for variety V_2 **(**Irrigation at 35 mm Pan evaporation up to 50 DAS then at 50 mm Pan evaporation up to harvest where receives 06 number of irrigation**).** Highest pol% was found 14.15 for I_5V_1 at irrigation 45 mm Panevaporation up to 50 DAS then at 50 mm Pan evaporation receives 06 nos. of irrigation.

Effect of irrigation on yield and quality of processing potato varieties: This experiment was conducted at IWM Division, BARI, Gazipur to determine the effect of irrigation on yield and quality of BARI Alu-25 (Asterix) and BARI Alu-28 (Lady Rosseta). Six irrigation treatments, each replicated thrice in a randomized complete block design revealled that plant height, tuber length, non-marketable yield, infected yield, scab yield, marketable yield, and total yield were significantly influenced by different irrigation treatments. The highest marketable yield (12.94 t/ha) was found in treatment combination T_4V_2 (irrigation at stolonization and bulking stages) followed by 12.27 t/ha in treatment combination T_1V_2 (irrigation at stolonization stage) and the lowest yield of 4.42 t/ha was found in treatment combination T_5V_1 (irrigation at tuberization and bulking stage). The stolonization stage was found the critical stage to irrigation for processing potato varieties. The highest amount of water use (180.76 mm) was found in treatment combination T_4V_2 while the lowest (10.6 kg/m^3) was used in treatment combinationT_1V_2. The highest water productivity (10.60 kg /m^3) was found in treatment combination T_1V_2 while the lowest (2.71 kg /m^3) was found in treatment combination T_5V_1. The variety-1 is seemed to be more susceptible to scab disease than variety-2. Also, variety-1 is more susceptible to irrigation than variety-2.

Effect of irrigation on the yield and quality of litchi: The study was conducted at the existing litchi orchard of Regional Agricultural Research Station, Hathazari, Chittagong to determine the effect of irrigation as well as to identify the critical stage to irrigation and quality of litchi during 2012-2013. Yield and yield contributing characters varied significantly among the treatments. The litchi yield ranged from 10 kg/plant to as high as 43.28 kg/plant. The lowest yield (10 kg/plant) was obtained from the treatment T_1 (Non- irrigated tree) and the highest yield (43.28 kg/plant) was found from treatment T_4 irrigated at flowering and fruit setting stages. The highest amount of seasonal water (207.0 mm) was used by the highest yielded treatment. The economic return/tree was also the highest (Tk. 3131.0) from the irrigated trees (T_4).

Performance evaluation of fertigation on the yield and quality of strawberry: Two drip irrigation levels i.e., alternate day and two days interval and three fertilizer doses $N_{110}K_{110}P_{40}S_{25}$, $N_{90}K_{90}P_{40}S_{25}$ and $N_{70}K_{70}P_{40}S_{25}$ with two different strawberry varieties were tested. Soluble fertilizers like N and MoP were applied with water through drip irrigation system. First irrigation and fertilizer application were done at 30 and 32 days after transplanting (DAP), respectively. The cumulative effects of irrigation water, fertilizer doses and varieties are noticed that the lowest fertilizer dose ($N_{70}K_{70}P_{40}S_{25}$), alternate day irrigation and FA-016 strawberry variety produced highest yield and it might be suitable for strawberry cultivation in Joydebpur but it required longer cropping season (100.33 days) than that of BARI strawberry-1. Regarding the quality, BARI strawberry-1 obtained high TSS but produced low P^H and vitamin-C as compared to the FA-016 variety. The seasonal water use varies from 422.3-606.6 mm

for a good yield (176.44-761.60 gm/plant) in Joydebpur under normal rainfall condition. The highest benefit cost ratio was seen in the variety of FA-016 (15.80) than that of BARI strawberry-1 (4.63) utilizing with alternate day irrigation and low fertilizer doses in both variety.

Response of different levels of irrigation and mulching to bitter gourd cultivation: An experiment was conducted at the research field of Irrigation and Water Management (IWM) Division, Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur during the kharif-1 season of 2013 to find out the interval and quantity of irrigation water required with mulch and without mulch for the potential yield of bitter gourd. Eight different irrigation options with mulch and no mulch were used to see their effects on the yield of bitter gourd. The highest yield (15.31 t/ha) was obtained from treatment T_6 which received 4 irrigations at 14 days interval with mulch followed by the treatment T_7 (13.13 t/ha) irrigated at 21 days interval with mulch receiving 3 irrigations. The lowest yield (6.07 t/ha) was obtained from treatment T_4 (28 days interval without mulch).

Effect of irrigation levels on seed quality and yield of hybrid maize: The experiment was conducted at the experimental field of IWM Division of BARI, Gazipur during 2012-2013 to investigate the influence of irrigation on seed quality and seed production of hybrid maize. Parental lines of BARI Hybrids Maize-9 (BIL79 x BIL28) were sown in isolation (time) maintaining ratio of four female rows alternate with two male rows (4:2). Male rows were sown in two different dates for synchronization. Four levels of irrigations T_1: Two irrigations each at vegetative stages (50-60 DAS)+grain filling (110-120 DAS) stages, T_2:Two irrigations each at silking stage (80-90 DAS)+grain filling (110-120 DAS) stages, T_3: Three irrigations each at vegetative stage+silking+ grain filling stages *and* T_4: Four irrigations each at (20-25 DAS)+vegetative+silking+ grain filling stages were taken. The results revealed that most of the parameters were higher in T_4 treatment. The highest seed yield (6.30 t/ha) was observed in T_3. Male plants gave higher yield than female plants.

Effects of deficit irrigation and mulch on onion seed production: Eight treatments comprising of four levels of irrigation regimes (irrigating up to 40, 60, 80, and 100% soil moisture deficit (SMD)) and two levels of mulching (no-mulch and mulch) were tried. Basin irrigation was used and the crop was planted in basins. Water applied per irrigation, soil moisture contents before and after irrigation was monitored throughout the season while the growth, yield parameters and yield of onion seed were recorded. Deficit irrigation and mulch had significant effect on seed yield. The seed yield ranged from 1039.52 to 1565.81 kg/ha with the lowest in treatment of 40% DSM without mulch and the highest in full irrigated mulch treatment. Analyses of results showed that irrigating onion up to 40% DSM reduced seed yield by about 30%. Applying water up to 60% of DSM caused a yield reduction of about 17%. However, irrigating onion up to 80% of DSM reduced seed yield by less than 3%. Results also revealed that water use of onion crop were largely influenced by the depths of water applied rather than mulching. Total water use ranged from 158.5 to 241.4 mm with minimum in mulch treatment of 40% DSM and maximum in full irrigated treatment. Mulching with rice straw improved significantly the water productivity of the seed onion crop. The water productivity was found to be the highest (0.73 kg/m^3) in the mulched treatment that received irrigation up to 80% DSM with a total water use of 213 mm. This treatment also produced near to the highest yield with 17% saving of irrigation water.

Evaluation of wastewater as a source of N, P, K for potato cultivation: A set of field experiments was conducted at the farmer's field in Terokhada village of Rajshahi city area during Rabi season of 2012-2013 to identify the right dose of N-P-K fertilizers for potato (cv. Diamant) production by irrigation with municipal wastewater. The treatments of each experiment had five different levels of particular nutrient (N= 0, 120, 150, 180, 210; P= 0, 8, 12, 16, 20; K = 0, 60, 80, 100, 120 kg/ha) under investigation while other major nutrients were kept at the recommended dose. The varying levels of nitrogen and phosphorus had significant influence on growth and yield variables, and yield of potato. The tuber yield of potato increased to attain their maximum values up to nitrogen rate of 150 kg/ha and phosphorus rate of 12 kg/ha; beyond this tuber yield decreased. The omission of N and P reduced all the growth and yield variables as well as the yield of potato. The reduction in the growth and yield variables due to the omission of P was less than that due to the omission of N. Unlike N and P, the higher doses of K showed no significant effect on the growth and yield of potato. For all cases, the maximum yield does not obtain with the maximum fertilizer application. Regression analysis indicates that N-P-K of 137-14-72 kg/ha can be a balanced dose for potato production by irrigation with wastewater.

Development of nutrient and water management package for summer tomato cultivation under

controlled environment: This experiment was undertaken with different levels of fertilizers under drip irrigation to develop a nutrient and water management package for summer tomato (BARI hybrid tomato-8) cultivation in sandy clay loam soils of BARI, Gazipur during Kharif-1 season of 2012. Three levels of fertilizers, i.e. N_{100} P_{55} K_{120} $B_{1.0}$ $Zn_{4.0}$ $Mg_{4.0}$ kg/ha, N_{100} P_{70} $B_{2.0}$ $Zn_{6.0}$ $Mg_{8.0}$ kg/ha and N_{100} P_{55} K_{120} kg/ha (control) were considered under drip irrigation applied at 2 days interval. The treatments were arranged with mulch and without mulch. Rice straw was used as a mulching material. The treatment (T_4) with fertilizer doses N_{100} P_{55} K_{120} $B_{1.0}$ $Zn_{4.0}$ $Mg_{4.0}$ kg/ha with straw mulch produced the highest marketable yield of summer tomato (40.98 t/ha) with minimum cull yield. The lowest yield (30.96 t/ha) was obtained from the treatment (T_3) having no micronutrients and mulch use of micronutrients and mulch showed a significant differences in yield. All the mulched treatments received 297 mm of seasonal water. The non-mulched treatments received 297 mm of seasonal water. The highest BCR (4.51) was found in high yielding treatment T_4.

Determination of crop co-efficient values of onion for seed production: A field experiment was conducted with BARI Piaz-1 to determine crop co-efficient values for seed production with lysimeter at the IWM Research field, BARI, Gazipur. The crop coefficient values of 0.68, 0.93, 1.23 and 0.78 were determined for initial, development, mid-season and late season stages of onion (variety: BARI Piaz-1) for seed production. These locally determined values of onion were found within the FAO recommended ranges. The value of K_c for the late season stage (0.78) varied slightly from the recommended values. Since this was a location specific experiment, a little variation in experimentally determined values of K_c from the recommended values (0.85-0.9) was observed. This might be due to the effect of local soil and temperature as well as crop variety on crop ET. However, locally determined values are always preferred to the generalized values for the estimation of crop ET.

Performance of advanced wheat genotypes under different levels of salinity: This study was conducted in plastic pots at BARI, Gazipur. Eight wheat genotypes and 2 varieties were considered for trial. Four levels of salinities i.e. 4dS/m, 8dS/m, 12dS/m and 16dS/m were considered for irrigation water. Among the ten genotype/varieties, 5 (five) of them i.e. BARI Gom-25, BAW-1146, BAW-1147, BAW-1150 and BAW-1157 performed well up to salinity of 12dS/m. These 5 genotypes may be considered for further trial for screening best one against salinity.

Response of different levels of n to the growth and yield of boro rice in saline prone areas: The field experiment was carried out at the clay saline soils of ARS, Benerpota, Shatkhira to observe the effect of different levels of Nitrogen on the growth, yield and Biomass for Boro rice (BRRIdhan-47). 5 (five) levels of N viz. 25%, 50%, 75%, 100% and 125% of recommended doses including a control (0%). The grain yield was not varied significantly among the treatments. This might be the rich of organic matter in the soil. The primary data on physiological growth and yield were generated those will be used as model inputs.

Performance of boro rice under different levels of saline water irrigation: The study was conducted at the sandy clay loam soil of IWM Divisional Research field at BARI, Gazipur during the rabi season of 2012-2013 with Boro rice (BRRIdhan-28) to generate the primary physiological data of rice under different salinity stress conditions at different growth stages and to determine the impact of salinity of biomass and yield of rice. Five (5) levels of saline water viz. 3dS/m, 6dS/m, 9dS/m, 12dS/m and variable salinities at different stages were imposed as irrigation. The water salinity was created artificially with a mixture of Nacl and $CaCl_2$. The highest grain yield (6.49 t/ha) was found in treatment T_3 irrigated with saline water of 3dS/m which is almost like non-saline. The lowest grain yield (0.66 t/ha) was found in the treatment of 12dS/m salinity. So, the effect of salinity stress on the yield of Boro rice was obtained from this trial which will be used as the input of agricultural model.

Optimum water use in conservation tillage for wheat cultivation: The study was conducted at the research field of the Irrigation and Water Management Division, BARI, Gazipur during the season of 2012-2013 with a view to evaluate the interaction of different tillage methods with different soil water regimes on wheat (BARI Gam-24) growth and production. A significant response of wheat to different tillage methods and irrigation schedules was observed. Among the different tillage methods, performance of raised bed method applying three irrigations was relatively better yielding the highest (4.373 t/ha). In respect of irrigation, since three irrigations at three different critical stages were applied in I_3 treatments, better yields were obviously obtained from those treatments. In respect of water productivity (WP), the I_1 (irrigated once at CRI stage) treatments performed better giving a relatively higher

WP values since a reasonable yields were obtained applying less irrigation water.

Cultivation of maize using regulated deficit irrigation: The study was undertaken to determine the water productivity of maize (BARI Hybrid Maize- 5) under deficit irrigation practice and to identify crop growth stages during which the crop can withstand water stress with limited effect on yield. The results showed that variation in timing and amount of irrigation had a reasonable impact on grain yield. The stem-elongation stage was found as the most sensitive to water stress. On the other hand, water deficit during the early and maturity stage had a limited effect on yield. Imposing water deficit at the heading stage (treatment T_3) resulted to the highest yield reduction. Water productivity was observed the lowest (1.88 kg/m^3) for the same treatment and the highest (2.62 kg/m^3) for the treatment T_4 (stress at the grain filling stage). The highest yield (8.00 t/ha) was obtained from the treatment T_1 which was fully irrigated (four irrigation at four growth stages). On the other hand, a slightly low yield (7.930 t/ha) was obtained from the treatment T_2 (three irrigation at three stages except stem elongation).

Optimum water and fertilizer for wheat planted on raised bed: The study was carried out in the experimental field of the Irrigation and Water Management Division, BARI, Gazipur with a view to evaluate the interactive impact of irrigation and fertilizer on wheat (cv. Pradip) cultivated on raised bed. Irrigation scheduling based on pan evaporation was not found very effective in comparison to the recommended interval based irrigation scheduling. Comparatively more irrigation water was required for this method without increasing grain yield. The highest grain yield (4.700 t/ha) was obtained from the treatment irrigated thrice at three growth sensitive stages with an optimum fertilizers dose. One irrigation at the most critical growth stage (17-21 DAS) was found very effective in respect of water productivity. Reduced fertilizer doses gradually decreased the grain yields in all cases.

Water requirement and irrigation scheduling of different crops in different cropping systems: The objectives of this project are to determine the irrigation requirement, water requirement and water productivity of different crop mutants/varieties developed by BINA in different AEZ, to find the suitable cropping pattern depending on available water resource and rainfall under abundant or deficit water supply, and to study the effect of water-logging for crops to be grown in low-lying areas or of sensitive in nature. This year, irrigation management for rice cultivars Biadhan-8 and Binadhan-10, chickpea, and mustard mutants/cultivars were investigated. For rice, it is observed that AWD at 5 days after disappearance of ponded water produced almost similar yield to that of continuous ponding method with 42% water saving. The chickpea cultivars do not need any irrigation at Magura, rather it reduces yield. For mustard it is revealed that one irrigation at vegetative *or* flowering stage is sufficient for optimum yield.

Studies on groundwater for its sustainable use in irrigation: Observation wells (OW) were installed earlier at BINA farm, Mymensingh and its sub-stations at Ishurdi, Rangpur and Magura. Water table (WT) is being monitored from all the locations fortnightly to know the WT fluctuation pattern and predict groundwater availability for its withdrawal during the dry season. Water quality aspects (mainly for irrigation) from different sub-stations (STW, DTW, canal water, etc.) have also been monitored over time to observe the seasonal as well as long-term changes.

Development of soil moisture declination model for alternate wetting and drying irrigation in rice cultivation: Experiment was set up in BRRI farm, Gazipur, in boro season 2012-13 with the objectives to develop a model for irrigation time prediction in intermittent irrigation. BRRIdhan28 was transplanted with 40 days old seedlings. The experiment contains six treatments and each of them was replicated thrice. The treatments were T_1= Maintaining continuous standing water (1-5 cm), T_2= Maintaining continuous standing water (1-5 cm) with seepage loss protection, T_3= AWD irrigation (up to 15 cm below ground level), T_4= AWD irrigation (up to 15 cm below ground level) with seepage loss protection, T_5= AWD irrigation (up to 30 cm below ground level) and T_6= AWD irrigation (up to 30 cm below ground level) with seepage loss protection. Individual plot size was 3 m x 4 m and each plot was separated from others with 1 m buffer area. A spacing of 20 cm x 20 cm was maintained. To protect seepage loss from the plots polyethylene sheets were placed around the earthen levee. However, among the treatments, highest yield was obtained from continuous standing water plots (T_1=5.39 kg/ha, T_2=5.06 kg/ha) followed by 15 cm (T_3=5.00 kg/ha, T_4=4.84 kg/ha) and 30 cm (T_5=4.57 kg/ha, T_6=4.52 kg/ha) AWD plots. Irrespective of treatments, higher yield was obtained from non-protected plots compared to the protected plots.

Validation of crop model oryza2000 under AWD water management and effect of USG in rice

production: Fourteen irrigations were applied in CSW and 10 irrigations were applied in AWd-15 and AWD-20 water regimes. The irrigation water applied for BRRIdhan28 varied from 584 to 738 mm and that for BRRIdhan29 varied from 561 to 825 mm depending on the crop growth duration. The amount of rainfall received by BRRIdhan28 and BRRIdhan29 were 48 and 161 mm. Percent water saved for BRRIdhan28 in AWD-15 and AWD-20 were 18 and 21 and that for BRRIdhan29 was 27 and 32. The yield data of two varieties showed that there was significant interaction among the water regimes and nitrogen levels and also in varieties. For both the rice varieties, USG application produced significantly higher yield compared to prilled urea. But within the nitrogen level, there was a declining trend of yield with increased of AWD level. Continuous standing water and AWD at 15 cm water depth produced statistically similar yield of both the varieties. But AWD at 20 cm produced significantly lower yield compared to AWD at 15 cm and CSW for both the varieties. There was significant variation was found in water productivity (WP) among the water regimes and nitrogen levels and also in varieties. For both the variety, WP was in increasing trend. But it produced the higher WP among the AWD-15 within the nitrogen level with an exception of WP between AWD-20 and USG application. It may conclude that based on the yield, water saved and WP, AWD-15 was the best water application method for Boro rice production and there was no conflict in USG application with AWD water regime.

Improving low-cost check valve for STW and test its performance in field level: Experiment was set up in BRRI farm, Gazipur, in Boro season 2012-13 with the objectives to develop a low-cost check valve for overcoming priming problem of STW and to find out the suitability in the field level. Three types of check valves were developed as per design. T_1 = 150 mm X 100 mm (6"X4") diameter check valve made by GI pipe, T_2 = 150 mm X 100 mm (6"X4") diameter check valve made by GI sheet, T_3 = 150 mm X 100 mm (6"X4") diameter check valve made by cast iron, and T_4 = 150 mm X 100 mm (6"X4") diameter check valve made by uPVC material. First two types of check valve were already made in a workshop at Gazipur and a contract was done to make the rest two types of check valve.

Terminal drought mitigation through integrated approaches in T. Aman cultivation: Two approaches were followed to find out the mitigation approach i.e., water management (rainfed and supplemental irrigation) and date of planting. Four planting dates were tested: T_1 = Transplanting on 10 July, T_2=Transplanting on 17 July, T_3= Transplanting on 24 July and T_4 = Transplanting on 31 July. A long duration variety (BR11) and a short duration variety (BRRIdhan33) were tested during Aman season. The historical rainfall data were collected from the Department of Agricultural Extension, Kushtia. Average rainfall amounts in the month of January, October and Nov were 11, 139 and 19 mm respectively. Higher rainfall than average weekly rainfall occurred only at the end week of July, 1st, 2nd and 3rd week of August, 2nd, 3rd and 4th week of October and 1st week of Nov. In most cases the weekly rainfall occurrence situation is not sufficient to fulfill the weekly demand (ET + S & P) of water in the previous year and this year also. So the crop is not getting rain water in time and is suffering from terminal drought. Most of the year rainfall ceased after 15 October. Only two supplemental irrigations at reproductive and one at early part of ripening increased yield by 1.16 t/ha (22%) over rainfed condition in T. Aman. The early transplanting of T. Aman through supplemental irrigation ensured that T. Aman effectively mitigated the terminal drought occurred at reproductive stage and at ripening stage during T. Aman, 2012.

Determination of suitable time for application of supplemental irrigation in T. Aman rice: Treatments were T_1 = Supplemental irrigation applied when water level reaches at 5 cm below ground surface, T_2= Supplemental irrigation applied when water level reaches at 10 cm below ground surface and T_3= Supplemental irrigation applied when water level reaches at 15 cm below ground surface. BRRIdhan49 was the tested variety. The rainfall was mostly occurred in the vegetative part of the crop, but it was not uniformly distributed. So, a supplemental irrigation was applied in vegetative stage. Then irrigation was applied in most critical stages, *i.e.,* reproductive stage and in early part of ripening stage. Application of supplemental irrigation at three different water levels below ground surface showed that there was no significant yield difference among the treatments. The highest yield was found in T_3 (irrigation when water level goes below 15 cm from ground surface), (6.39 t/ha) and the lowest was found in T_2 (irrigation when water level goes below 10 cm from ground surface), (6.15 t/ha) and yield difference was only 4%. From the results of 2011 and 2012 it was found that the depth of perch water table below up to 15 cm does not create drought in the soil. May depth of perch water table more than 15 cm will create drought. So the experiment with different perch water table (more than 15 cm) is needed to determine the beginning time of drought and actual time for supplemental irrigation.

Effect of drought on different T. Aman varieties: The treatments were replicated thrice. Based on growth duration the varieties were divided into 3 categories as short duration, medium duration and long duration. The seeding was done on 9th July 2012 and transplanting on 8th August 2012. TSP, MP, Gypsum and Zinc Sulphate were applied during the last ploughing. Urea was top dressed twice during vegetative growth. Weeding was done after urea applications. The rainfed plots were separated from the irrigated plots with 1 m buffer area. The levee of the rainfed plots was covered with polyethylene sheet. The perched water level status in the plots was monitored by installing perforated PVC tubes. Supplemental irrigation was applied in the irrigated plots when water level reaches 15cm below the ground surface. Total rainfall in the month of October and Nov were 32.5 mm and 70 mm, respectively. Water level data showed that stress was experienced in the rainfed plots from 9 October-3 Nov 2012 and 10 Nov-7 December 2012. BRRIdhan33 and BRRIdhan39 were under water stress during later part of the ripening phase. Due to photosensitivity BRRIdhan46 take 150 days growth duration which is higher than the short duration varieties. BRRIdhan31, BRRIdhan49 were under water stress since earlier part of the ripening phase. BR11, BRRIdhan30, BRRIdhan40 and BRRIdhan44 were under water stress since earlier part of the ripening phase. BR23, BRRIdhan41 and BRRIdhan46 were under water stress since the later part of the reproductive phase. The yield of BR11, BR23, BR25, BRRIdhan30, 31, 33, 39, 40, 41, and 46 under rainfed condition were 3.74, 4.14, 5.19, 4.94, 4.41, 5.14, 4.61, 4.43, 5.47, 5.31, 4.49 and 4.82 t/ha, respectively. The yield of BR11, BR23, BR25, BRRIdhan30, 31, 33, 39, 40, 41, 44 and 46 under irrigated condition were 4.03, 4.75, 6.17, 5.78, 4.49, 5.40, 5.27, 5.39, 5.65, 5.74, 5.40 and 5.92 t/ha, respectively. Results showed that the mean yield reduction due to drought stress in varieties ranges from 1.7 to 18.6 percent. Considering the growth duration, rainfall and perched water table data BRRIdhan31, BRRIdhan30, BRRIdhan49 and BRRIdhan40 were found more drought stress tolerant than the other varieties.

Effect of long-term groundwater extraction on the performance of STW and on crop production in coastal region of Bangladesh: The experiment was conducted at Sonagazi to assess the potentiality for development of suitable groundwater; to test the performance and cost-effectiveness of tubewell irrigation; and to monitor the long-term effect of groundwater extraction in coastal saline areas. It was found that a good water bearing aquifer exists at a depth from 155 m to 180 m (510-590 ft). The pump was discharging groundwater with salinity level ranged from 0.32 to 0.55 dS/m which was fresh and much below the permissible maximum limit (<4 dS/m). BR16, BRRIdhan28, 45, 47 and 58 were grown during Boro season, 2013. The yield of those varieties were 5.56 t/ha, 3.55 t/ha, 4.03 t/ha, 4.65 t/ha and 6.00 t/ha respectively. All the varieties performed well in irrigated condition. But it was observed that crop yields were low due to hail storm occurred before harvest (17 April, 2013). The mono-cropped area has been converted into a double cropped area which is good news for the coastal saline areas. The adjacent farmers have started installing tubewells for irrigating Boro rice. Performance of the tubewell is satisfactory.

Assessment of farm reservoir utilization for irrigating in the coastal area of Bangladesh: The experiment was done at the coastal region of Satkhira to assess the use of existing farm reservoir for crop production and to estimate economic benefit of farm reservoir for land productivity improvement. To fulfill of these objectives a pre-designed questionnaire survey was conducted. Farmers generally use pond water for domestic purpose as well as crop irrigation. Direct rainfall and runoff from the adjacent crop lands are stored in ponds as water reservoirs. In the month of July all ponds are full of water. Farmers cultivate vegetables in early Rabi with residual soil moisture. At the mid of Rabi season, farmers use pond water for irrigating when crops required water. Crop field soil salinity and pond water salinity were monitored in every month round the year to determine soil and pond water salinity trend. Rainwater conservation in pond is suitable for vegetable crops irrigation during Rabi season in coastal saline area. It is observed that existing farmers' pond water could irrigate at least 20% more crop area in Rabi season. It also seems that introduce of short duration HYV rice variety in coastal area instead of local variety would be more profitable.

Survey on surface water utilization and its scope for crop production in different agro-ecological zone of Bangladesh: A survey was conducted in Sylhet, Sunamganj and Moulvibazar districts to evaluate the present surface water utilization status and future scope of utilization. Discussion and questionnaire survey was conducted with different officials e.g. DAE, BADC, LGED, BWDB and farmers. Surface water is available for crop production in both dry and wet seasons. But under utilization of surface water for crop production is a common issue in both the locations. Recently, DAE, LGED, BADC and BWDB have taken some

initiatives to utilize surface water for crop production. Minor projects related to surface water development and utilization is implemented by DAE, LGED and BADC. On the other hand, major projects are implemented by BWDB. Farmers' participation in surface water development and utilization is essential; and local and regional planning should be developed for better utilization of surface water of that region.

Monitoring of groundwater fluctuation and safe utilization in different geo-hydrological regions: The long-term study was conducted at BRRI farm Gazipur, Rajshahi, Comilla, Bhanga, Kustia, Rangpur Satkhira and Habiganj to determine the fluctuation of groundwater level over time and its relationships with rainfall and to determine water quality including arsenic. During the reporting period maximum lowering of groundwater table was observed in March/April and minimum in September/October. The highest depth (30.16 m) was found in Gazipur and lowest (1.4 m) in Kustia area. The results showed that the groundwater level at BRRI farm Gazipur is declining day by day and it is not fully recharged after the monsoon. In 2000 the maximum groundwater level was about 15 m from the ground surface which is more than 30 m in 2012. So the lowering is about 15 m in 12 years which is very alarming situation. The lowering is due to increased pumping demand and scanty rainfall. Another study was conducted in 9 upazillas of of Rajshahi, Nawabganj, and Naogaon districts. It was observed that in most of the upazillas the trend of maximum groundwater level was lowering in nature which supports the BRRI findings.

Productive, profitable and resilient agricultural and aquaculture systems: To project activities were going on in three selected sites namely Khulna, Satkhira, and Barisal. Early establishment of boro rice sometimes exposed to cold stress but it can be recovered after temperature increase. It is important to have a well maintain seed bed and seedling age in that time to achieve successfully boro rice production. There is a great opportunity to used available fresh water in polder 43/2f for boro rice cultivation. In polder 30, boro rice could be grown if seed bed is ready first week of Nov and used some salt tolerant variety. It is possible to harvest HYV boro rice with a yield level 6.0 t ha^{-1}. Water melon, chili, mungbean and maize could be grown in undrained condition with mulched if sown on in December and January. This year these crops performed well and satisfactory yield. Sesame could be grown without mulch in last week of January and first week of February. To achieve better establishment and better yield of these Rabi crops it needs to be sown early and when the soil moisture is optimum.

Testing, validation and up scaling of water saving technology in rice production (TWST): The technologies tested were i) harvesting of rainwater in a farm reservoir for utilization in mitigating drought affected rice; ii) increasing irrigated area (command area) by minimizing conveyance loss through PVC pipe water distribution system (PWDS); and iii) use of 'Check valve' in Shallow Tube Well (STW) for reducing hassle of repeated priming. One hundred sixty farmers, of them 50% are participatory and the rest are associated, were selected. One Bigha (0.13ha) land of each selected farmer was taken for experiment. Technology (i) was validated during Aman season in 2011 and 2012 at Dhamurhat. The variety Sharna was transplanted under research management (RM) and rainfed condition (farmers' management) during Aman season, 2012. In the year 2012, terminal drought occurred at just after flowering stage of Aman rice and maximum two supplemental irrigations were given at RM plots to mitigate drought. It is mentionable that during this year rainfall distribution was well. Hence drought occurred at medium severity. The supplemental irrigated and rainfed Aman rice yielded 5.18 t/ha and 4.75 t/ha, respectively. About 7.25 % yield was increased and average benefit was 3475 Tk/ha due to applying supplemental irrigation. Forty percent of the Farm reservoir (FR) was remained full with water after harvesting T. Aman crop at Aranoger. Rabi crops such as onion, chili and wheat were cultivated occupying 0.3 ha and Pumpkins were also grown on the bank of the FR. Two irrigations were given from FR to the rabi crops. A good harvest of Rabi crop was obtained. Technology (ii) and (iii) were validated during Boro season in 2011-12 and 2012 - 2013 at Dhamurhat but at Hossainpur, Kishoregonj only technology (iii) was validated. Irrigated area was increased by 42% (4.2 ha) in two years. The farmers were benefited by 10078 Tk/ha because of reducing irrigation cost.

Adoption and demonstration of water saving technologies at farmers fields: In Rangpur region, during Aus season, performance of BRRIdhan48 was promising. The results of field demonstrations indicate that the impact of supplemental irrigation mainly depends on rainfall distribution patterns and the last precipitation of the season. Generally farmers transplant paddy in July/August and harvested it in Nov/December during T. Aman season. Rainfall amount become less at the later part of the T. Aman season, in the months of October-Nov. Terminal

drought may occur at this part of growing season of T. Aman season. Under this situation, 2 to 4 timely supplemental irrigation could produce on an average 30% more yield in Rangpur region while in Barisal region, it was 30-50 percent due to application of one additional supplemental irrigation. Result also reported that average 1.38 kg of paddy rice could be grown by applying one cubic meter of water as supplemental irrigation over rain-fed condition at the proper time in Rangpur region. Rainwater harvesting by levee or bund management during rainfall in the farmer's fields, mean grain yield increased by 12.76 percent in Rangpur region while in Barisal region, it increased by 20 percent irrespective of variety. The levee or bund height should be 15-20 cm and need proper maintenance from land preparation to end of the season. About 3-7 number of irrigation could be saved by using AWD technology which was also increased water productivity. It saved about 19 to 33%, thereby saving about Tk. 2900-5000/ha and Tk. 2300-3200/ha fuel cost for Rangpur and Barisal regions, respectively.

Climate change impacts, vulnerability and adaptation: sustaining rice production in Bangladesh: The study was conducted in three upazilas of Rajshahi and Chapai Nawabganj districts, which represent typical drought prone areas of Barind Tract and in three upazilas of Patuakhali and Barguna districts, which represent the saline prone area. In each upazila for longer duration variety like BRRIdhan49 and Swarna, 3-4 supplemental irrigations were applied amounting 180 to 240 mm of water. On the other hand, for short duration variety like BRRIdhan56 and BINA dhan7, 2-3 supplemental irrigations were applied with 120 to 180 mm of water. The yield performance of BRRIdhan49 was slightly higher (4.54 to 4.66 t/ha) with shorter growth duration (127 to 132 days) compared to the local popular variety Swarna (4.42 to 4.45 t/ha) with slightly higher growth duration (144 to 146 days). On the other hand, short duration varieties BRRIdhan56 and BINA dhan7 were performed similarly with similar growth duration. Total water used including of effective rainfall varied from 560 to 717 mm with water productivity varied from 5.60 to 7.46 kg/ha-mm. Farmers of Tanore and Gomastapur prefer to cultivate BRRIdhan49 due to higher yield with comparatively lower growth duration. But the farmers in Godagari prefer to grow BRRIdhan56 due to its short duration for timely establishment of early Tomato in their locality. During T. Aman season, no impact on salinity was found in this area. In each upazila, slightly shorter duration variety like BRRIdhan41 (4.93 to 5.03 t/ha) and BRRIdhan46 (5.11 to 5.21 t/ha) performed well with compared to the slightly long duration local popular variety Tepu/Sadamota 4.36 to 4.45 t/ha). Farmers of the tested upazilas prefer to cultivate BRRIdhan46 due to higher yield with comparatively lower growth duration because of its suitability as late planted crop. Some farmers also prefer BRRIdhan41 for its higher yield. In Rajshahi region, BARI Gom24 performed better (2.67 to 4.40 t/ha with growth duration of 113 to 124 days) with 2 to 3 supplemental irrigation amounting 252 to 292 mm including 132 mm rainfall compared to BARI Gom26 (2.68 to 3.96 t/ha with GD of 118 to 127 days). The water productivity of BARI Gom24 varied from 10.60 to 17.46 kg/ha-mm. Both the variety of BARI Sharisa14 and BARI Sharisa15 performed better (1.10 to 1.51 t/ha with 1 supplemental irrigation of with rainfall, which amounting 192 mm) with the water productivity of 5.73 to 7.86 kg/ha-mm. BARI Chola5 and BARI Chola9 performed better in rainfed condition with some germination problem (0.71 to 1.21 t/ha with 132 mm rainfall) and the water productivity varied from 5.38 to 9.17 kg/ha-mm.

Identification of location specific rice cultivation problems and minimizing rice yield gap through BRRI technologies: Experiments were conducted during T. Aman 2012 and Boro 2013 seasons at farm level in 3 upazilas of Jessore district to identify location specific rice cultivation problem and to minimize rice yield gap through BRRI technologies. In T. Aman season, yields of BRRIdhan49 under RM were 5.05 t/ha, 5.15 t/ha and 5.25 t/ha compared to 4.45 t/ha, 4.60 t/ha and 4.65 t/ha under FM in Bagarpara, Chowgasa and Sharsha Upazila, respectively. About 11% higher yield was obtained under RM plots compared to FM plots due to better fertilizer management and supplemental irrigation. Comparative costs and returns analysis showed that undiscounted benefit cost ratio (BCR) were 1.81, 1.96 and 1.84 in RM plots and 1.59, 1.67 and 1.65 in FM plots in Bagarpara, Chowgasa and Sharsha Upazila, respectively. Yields of BRRIdhan28 under RM were 4.48 t/ha, 6.52 t/ha and 6.86 t/ha compared to 4.20 t/ha, 6.10 t/ha and 6.32 t/ha under FM in Bagarpara, Chowgasa and Sharsha Upazila, respectively. It was observed that the yields in FM plots were 6%-8% lower than RM plots in Bagarpara, Chowgasa and Sharsha Upazilas, because farmers tried to follow RM practices in their plots. But in case of Bagarpara Upazila, farmers got about two tones less yield in both RM and FM plots compared to Chowgasa and Sharsha Upazilas due to natural calamities. Comparative costs and returns analysis showed that undiscounted benefit cost ratio (BCR, full cost basis) were 0.72, 1.07 and 1.10 in RM plots compared to 0.68, and 1.03 in FM plots in Bagarpara;

and chowgasa and Sharsha Upazila, respectively. In both Chowgase and Sharsha BCR were higher in RM plots than FM plots which are profitable. Similar experiments were conducted during T. Aman'12 and Boro 2013 seasons at farm level in 3 upazilas of Bogra district. Yields of BRRIdhan49 under RM were 5.35 t/ha, 5.25 t/ha and 5.08 t/ha compared to 4.65 t/ha, 4.72 t/ha and 4.60 t/ha under FM in Sonatala, Sariakandi and Sherpur upazila, respectively. About 11.80% higher yield was obtained under RM plots compared to FM plots due to better fertilizer management and supplemental irrigation. Comparative costs and returns analysis showed that undiscounted benefit cost ratio (BCR) were 1.16, 1.14 and 1.15 in RM plots compared to 1.12, 1.10 and 1.10 in FM plots in Sonatala, Sariakandi and Sherpur upazila, respectively. Thus, in all cases higher BCRs were observed in RM plots. In Boro season, BRRIdhan28 was grown two upazilas (Sonatala and Sariakandi) and BRRIdhan29 was grown in Sherpur upazila. Yields under RM were 6.43 t/ha, 6.10 t/ha and 7.60 t/ha compared to 5.90 t/ha, 5.65 t/ha and 6.80 t/ha under FM in Sonatala, Sariakandi and Sherpur upazila, respectively.

1.3 Postharvest Technology of Crops

Effect of different packaging techniques on the quality and shelf life of pointed gourd (*Trichosanthes dioica* Roxb.): The experiment was conducted to evaluate the effect of plastic/wooden crates and packaging materials on the quality and shelf life of pointed gourd during transportation and storage using passive modification of modified atmosphere packaging system. The modified atmosphere was created by making perforation in the polypropylene packets. Pointed gourd pre-treated with chlorine(200 ppm chlorox/halotab, 2 tablets per 1.5 liter water) water and then transportation in wooden or plastic crates and packaging and storing in 1.2% perforated polypropylene packets resulted substantial reduction in losses due to physiological weight loss and rotting/shriveling and retained considerable marketable quality. These treatment combinations also considerably retained vitamin C and A (β-carotene). Under this condition the retention of quality and shelf life of pointed gourd could be extended up to 10 days at ambient condition as compared to non-treated and without packaging.

Postharvest quality retention in litchi cv. Bombay by application of 1-methyl cyclopropene: The experiment has conducted to investigate the effect of aqueous 1-methylcyclopropene (1-MCP) and modified atmosphere packaging (MAP) on the shelf life and quality of harvested litchi fruit.. Litchi fruits at commercial mature stage were fully immersed in aqueous 1-MCP at 200, 400, 600, 800 and 1000 μgL^{-1} for 5 min, quickly removed the water from fruit surface by fan and then stored in 0.5% perforated polypropylene packets at 5°C and 90-95% RH. 1-MCP treatment in combination with MAP delayed pericarp browning and fruit softening, and thus, extended shelf life. The changes in fruit TSS, ascorbic acid, total acid contents and surface colour of fruit treated at two higher levels of 1-MCP remained strongly suppressed and consequently extended at least 20 days extra storage life compared to control fruit. Thus, postharvest application of 1-MCP at 600 μgL^{-1} in combination with the use of MAP can extend the storage life of litchi up to 20 days.

Effect of ripening chemicals of postharvest quality of mango (*Mangifera indica* L.) cv. Langra: The experiment was conducted to evaluate the effect of ripening chemicals (ethephon) on postharvest quality of mango (Mangifera indica L.). The various concentrations of ripening chemicals (ethephon 250 ppm, 500 ppm, 750 ppm, 1000 ppm and 10000 ppm) were used in the study for ripening of mango under ambient conditions. The treated fruits were assessed for physiological changes such as ripening percentage, weight loss of fruit (%), biochemical aspects such as TSS (^{0}Brix), titratable acidity (%), reducing sugar (%), total sugar (%), ascorbic acid content (mg/100g), total carotenoids (mg/100g) and residual level of the applied ethephon. The observations were recorded at 2, 4 and 6 days after storage. It was found that ethephon can be applied @500ppm-750ppm at matured stage of mango for uniform ripening within 6 days at ambient temperature (23±2°C). The residual level of the applied ethephon was detected as 0.11ppm-0.58ppm at edible stage, which was lower than MRL (2ppm).

Effect of ripening chemicals of postharvest quality of papaya (*Carica papaya* L.): The experiment was conducted to evaluate the effect of ripening chemicals (ethephon) on postharvest quality of papaya. The various concentrations of ripening chemicals (ethephon 250 ppm, 500ppm, 750 ppm and 1000 ppm) were used in the study for ripening of papaya under ambient conditions. The treated fruits were assessed for physiological changes such as ripening percentage, percentage weight loss of fruit (kg), biochemical aspects such as TSS (^{0}Brix), titratable acidity (%), reducing sugar (%), total sugar (%), ascorbic acid content (mg/100g), total carotenoids (mg/100g), percentage CO_2 increase and and residual level of the applied ethephon. The observations were recorded at 3, 5 and 7 days after storage (23±2°C).

Ethephon can be applied @500ppm-750ppm at matured stage of papaya for uniform ripening within 5 days at ambient temperature (23±2°C). The residual level of the applied ethephon was estimated as 0.21ppm-0.45ppm at edible stage, which was lower than MRL (2ppm).

Effect of ripening chemicals of postharvest quality of tomato (*Lycopersicon esculentum*): The experiment was conducted to evaluate the effect of ripening chemicals (ethephon) on postharvest quality of tomato (Lypersicon esculentum). The various concentrations of ripening chemicals (ethephon 250 ppm, 500 ppm, 750 ppm, and 1000 ppm) were used in the experiment for ripening of tomato under ambient conditions. The treated fruits were assessed for physiological changes such as ripening percentage, biochemical aspects such as pH ,TSS (%), titratable acidity (%), ascorbic acid content (mg/100g), total carotenoids (mg/100g). The observations were recorded at 3, 6 and 9 and 12 days after storage. Tomato treated with ripening chemical (ethephon) enhanced the ripening process within 3-4 days (breaker stage) and it turned to light red (60-90%) within 6-8 days whereas the non-treated tomato did not uniform colour developed even after 12 days (turned to light red). From the experiment it was found that ethephon can be applied @750ppm-1000ppm in breaker stage of tomato for uniform ripening within 6 days at ambient temperature (22±2°C). The residual level of the applied ethephon was estimated as 0.18ppm-0.88 ppm at edible stage, which was lower than MRL (2ppm).

Soils

Project Development and Implementation

Development and coordination of projects are the major responsibilities of BARC. The Soils Unit of BARC is working in line with the mandate of the Council. The Unit oversees the soil fertility and fertilizer management related programs in the country. During 2012-13 the Unit is involved in coordination of four coordinated Sponsored Public Goods Research (SPGR) Sub-Projects and implementation of one single component Sub-Project under the National Agriculture Technology Project (NATP) funded by the Word Bank, IFAD, IDA and GoB. The Member-Director (NRM), BARC is working as the Coordinator and CSO and PSOs of the Unit are working as the Associate Coordinators of the Sub-Projects. Besides, the Unit also looks after the other soil fertility and fertilizer management related single component SPGR Sub-Projects of NATP implemented by different NARS institutes in the country. The SPGR Sub-Projects those are coordinated and implemented by Soils Unit of BARC are as follows:

SPGR Sub-Projects coordinated and implemented by Soils Unit of BARC

Sl. No.	Sub-Project Title	Organization
Coordinated Sub-Project		
1.	Land Productivity and Its Enhancement through Utilization of Surface Water in Coastal Area of Bangladesh	BARC, BARI and SRDI
2.	Carbon Sequestration in Soils of Bangladesh	BARC, BRRI, BINA and BSMRAU
3.	Coordinated Project on Arsenic in Soil-Plant-Water System	BARC, BARI and SRDI
4.	Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns	BARC, BARI, BRRI, BINA, BJRI, BSRI, SRDI and BAU
Single Component Sub-Project		
5.	Updating of Fertilizer Recommendation through Interpretation of Research Results Generated by the NARS Institutes	BARC
6.	Development of Nitrogenous Bio-fertilizer for Sugarcane with free-Living and Associative Bacteria Using Biological Nitrogen Fixation (BNF) Technology	BSRI

Besides, the Agricultural Land Management for Improving Soil Fertility and Irrigation Efficiency, and Production and Service of Agrometeorological Information for the Adaptation to Climate Changes projects funded by Asian Food & Agriculture Cooperation Initiative (AFACI) are being implemented under the supervision of Soils Unit of BARC.

Policy Level Contribution

Activity of Fertilizer Technical Sub-Committee

Fertilizer Technical Sub-Committee was formed by the Ministry of Agriculture (MoA) in 1997 to help the National Fertilizer Standardization Committee. Member-Director (NRM), BARC works as the convener and Additional Director (Implementation), DAE as the Member Secretary of the committee. The committee comprises of 19 (nineteen) members with the CSO (Soils), BARC, CSOs of Soil Science Divisions of different NARS institutes, CSO, OFRD; representatives from different concerned organizations like Departments of Environment, Livestock, Fisheries, BSTI, SRDI, BADC, BCIC etc. A plant physiologist from BARI is also working as a committee member for giving technical support in evaluation of plant growth regulators (PGRs).

During 2012-2013, two meetings of Fertilizer Technical Sub-committee were held with Member-Director (NRM) in the chair. A number of organic and chemical fertilizers and PGRs were evaluated in these meetings, among which twenty two (22) organic fertilizers were recommended for standardization to the National Fertilizer Standardization Committee headed by Secretary, Ministry of Agriculture.

Research Management and Coordination

Soils unit of Natural Resources Management Division of BARC is organizing a Soil Fertility and Fertilizer Management Research Review and Programme Planning workshop annually. The workshop was held during 4-6 September 2012 at BARC with scientific professionals involved with relevant soil research of the NARS institutes in the country. Research programme conducted in all NARS institutes during 2011-2012 were reviewed properly in the workshop. The workshop was divided into seven technical sessions and one recommendation session. The technical sessions were divided into different areas of soil fertility and fertilizer management research and environmental issues. Besides reviewing research programme, the proposed new research programme designed for 2012-2013 were also discussed in the workshop. Scientists from different NARS institutes took part in the discussion, contributed and shared their knowledge, thoughts and experiences for improvement of the programme and to avoid duplication of future research programme.

Monitoring and Evaluation

Scientists of Soils Unit worked as the team member of the Monitoring and Evaluation teams formed by the Planning and Evaluation Division of BARC. Member-Director (NRM) and Chief Scientific Officer (Soils), BARC worked as the Team Leaders of two monitoring groups formed for monitoring the SPGR Sub-Projects in 2012-13 and monitored the activities of the Sub-Projects assigned to their respective groups. Besides, two Principal Scientific Officers of the Unit also worked as the team members of the monitoring groups and actively took part in the monitoring activities. The Soils unit has the responsibility to evaluate the Soil and Fertilizer Management related proposals.

Report on SPGR Sub-projects

Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Pattern: Bangladesh Agricultural Research Council (BARC) in coordination with 8 other research components (BAU, BARI OFRD, BARI SSD, BRRI, BINA, BSRI, BJRI & SRDI) has implemented this coordinated research project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns with Member Director, NRM as its Coordinator. The project is a Sponsored Public Goods Research (SPGR) sub-project funded through NATP Phase-1. The sub-project was prepared considering overall situations of soil, crop, cropping pattern, soil fertility and fertilizer management in Bangladesh. About 20 major AEZs of Bangladesh have been covered focusing the major problems of the area. The sub-project also covered major crops and cropping patterns including vegetables and some short duration fruits as well as major intercrops. Special attention has also been given to micronutrient situation in soils and crops of Bangladesh to develop an environment friendly, agronomically and economically suitable combination of fertilizer nutrients for sustaining and improving crop productivity.

The sub-project was started in June 2011, completed its activity in December 2013. Uniform methodology that was adopted initially, continued for all the component institutions except BAU dealing with micronutrients where some necessary changes were made in the 2nd year (2012-13) based on the results of the first year (2011-12) to emphasize the effect Zn & B including their foliar application on crops and cropping patterns. System based approach has been accorded in each component. During the period of the project, two crop cycles have been completed in the pattern based study. In case of long duration crops like sugarcane, fruits, fodder etc. also two crops are harvested.

BARI OFRD extended their activity on a large number field experiments that include pattern based studies on 12 cropping patterns at 9 locations under 7 AEZs; 11 field, vegetable and spice crops as single crop trials at 7 locations; 3 each quick growing fruits and fodder crops at 4 locations each and three intercrop trials in 3 locations. Twenty-four crops including those of fruits and fodder were involved in the trials. BARI SSD was involved in 8 cropping pattern based field experiments at 7 locations under 5 AEZs along with a few single crop trials. Eleven field and vegetable crops were included. The activity of BRRI included some rice based cropping patterns under unfavorable ecosystems like char & saline, haor, submergence & cold, tidal flood and drought prone areas at 5 locations under 5 AEZs. BINA's activity included 6 cropping pattern based experiments at 9 locations under 7 AEZs involving 9 field and spice crops. Activity of BSRI concentrated

on intercropping in sugarcane with potato, onion and garlic at 3 locations under 3 AEZs. BJRI had conducted 4 field experiments with accession BJC 2195, var 0-795 (seed production), Potato-Jute-T.aman pattern (one location) and var.0-9897 at 8 locations and 7 AEZs. SRDI's activity centered around saline areas of 5 Upazillas in Khulna district (Fultana, Metro Thana, Dumuria, Rupsha and Batiaghata) mainly with Boro-T.aman pattern and some single crops like sweet gourd, Bitter gourd, spinach, Indian spinach and watermelon. BAU component being involved in micronutrient studies, conducted 8 pattern based and a few single crop experiments that included 12 crops at 6 locations under 6 AEZs. In the 2nd years (2012-13), effect of two micronutrients, Zn & B was emphasized including their effect of foliar application on crops/cropping patterns.

During *Rabi* seasons (2011-13), a large number field experiments were conducted on a number of crops and cropping patterns by all the component organizations. Reports of 1 or 2 crop cycles of pattern based including some and single crop experiments were presented in the project completing workshop held on More than 100 field trials with repetition in the following patterns/seasons (for single crop expt.) were carried out by component research organizations on a range of cereal, fibre, pulse, oilseed, tuber, vegetable, spice, fruit and plantation crops in 20 major AEZs of Bangladesh. The crops were Boro, T.aman & T.aus rice, wheat, maize, jute, lentil, chickpea, mungbean, cowpea, mustard, sesame, potato, sweet potato, tomato, cauliflower, cabbage, stem amaranth, lady's finger, sweet gourd,bitter gourd, spinach, Indian spinach, chilli, onion, coriander, garlic, water melon, banana, papaya, moringa, sugarcane etc. Beside experiments were conducted on some intercrops like Banana + potato, cheakpea + linseed, sugarcane + garlic, sugarcane + onion, sugarcane + potato and some fodder crops eg. german grass, napier grass and para grass. Fertilizer application produced significant positive effect on all cases irrespective of crops and soils. Treatment T_6 (STB rate + 25% additional NPK) recorded the highest response followed by T_3 (STB + 25% NP), T_4 (STB + 25% NK) and T_5 (STB + 25% PK). However in many cases STB rate produced identical effect with STB + 25% different combinations of NPK treatments but higher than 25% less NPK from STB rate and control treatments. Inter crops results were also similar. Results of short duration fruits, sugarcane and fodder crops also showed spectacular response to fertilizer application. Here the effect of T_6 was also dominant. Studies on micronutrients appeared that the effect of micronutrient varied with locations, crops and micronutrients. Distinct positive effect of Zn & B (always higher for Zn than B) on crops in the first crop cycle (2011-12) showed up also in the 2nd crop cycle (2012-13) under changed methodology. Soil application of Zn and B was found better than foliar spray for higher production.

It revealed from the base line study that soil organic matter and total nitrogen status was very low to low irrespective of AEZs or locations while P,K and Ca contents were inconsistent and the status of S was low to optimum except in coastal saline area where its status was very high. Among the micronutrients, Zn and B status was very low to low in some AEZs and low to medium in others while the status of other micronutrients (Fe, Mn & Cu) was high to very high although. Survey of river water salinity in the saline area indicated that the water is safe for irrigation from the month of July to December but harmful from February to May. River water should be checked for salinity level before use it for irrigation during January and June.

Coordinated Project on Arsenic in Soil-Water-Plant Systems: Arsenic (As) contamination of ground water is a severe problem in Bangladesh. Irrigation with As contaminated water may cause As build-up in soil which may eventually enter into rice grain and straw through plant uptake. So, the situation poses a great threat to crop yield, safe foods and human health. With this point in view, the BARC initiated a coordinated project on arsenic behavior in irrigation water-soil-rice plant system in Bangladesh. Three NARS institutes viz. SRDI, BRRI and BARI worked on this project. The project was started in April 2010 and ended in December 2013.

All the institutes carried out a baseline survey to delineate As status in soils, irrigation waters and rice grain & straw. The SRDI scientists collected 240 soil, 240 water and 300 grain & straw samples from three upazilas (Chandina, Kochua and Veramara) covering 24 unions for arsenic analysis. The BRRI researchers did this survey over four upazilas (Faridpur Sadar, Kolaroa, Shibalya and Natore Sadar) across 28 unions. They analyzed 834 soil samples, 400 irrigation water samples and 600 rice grain & straw samples. From the BARI component, 350 irrigation water, 700 soil (top & subsoils) and 700 rice grain & straw samples were collected from Chapai Nawabgonj Sadar, Brahamanbaria Sadar, Arihazar (Narayangonj district) and Avoynagar (Jessore) upazilas covering 35 unions, and 184 vegetable samples representing 21 types were collected from Faridpur, Jessore and Chapai Nawabganj districts.

Both spatial and temporal variations in As level were found. Location variation was district, but seasonal variation was not clear. Faridpur and Satkhira appeared to be As contaminated districts, however five unions of Kolaroa upazila (Murarikati, Keralketa, Jallabad, Jugikhali and Helathala), three unions of Faridpur Sadar (Aliabad, Kaijuri and Majchar) and one union lf Kochua (Koraia) were obwerved highly As contaminated. The results further indicate that 96% irrigation water samples from Chapai Nawabgang, 84% samples from B. baria, 25% samples from Arihazar and 45% from Avoynagar had As content above 0.1 mg L^{-1} (Maximum Permissible Limit). The As content of 89% soil samples from Chapai Nawabgong and 38% samples from B. baria had exceeded the 20 mg kg^{-1} (MPL) for agricultural soils. Plant (rice) analysis showed that 24% rice grain samples from Chapai Nawabgang, 15% samples from B. bari, 0% samples from Arihazar and 10% from Avoynagar had As content above 1µg g^{-1} (MPL); for straw samples all values exceeded 1 µg g^{-1}. Concerning vegetables, aroid leaves (1.59 µg g^{-1}), Indian spinach (1.41 µg g^{-1}), jute leaves (1.28 µg g^{-1}) and kangkong (1.24 µg g^{-1}) had high As level, all above 1 µg g^{-1}. However, estimation of daily As consumption by people through drinking water and various foods (rice, vegetables, fish etc.) is important. Nevertheless, drinking water is the predominant source of As entry into human body.

Varieties BRRIdhan47 and BRRIdhan50 were found to have low grain As content. In case of wheat, all varieties under test (BARI Gom 21, 22, 23, 24 & 26) across the locations produced similar grain yield(3.0–3.6 t ha^{-1}), although background soil As was high ranging from 24.5-36.4 mg kg^{-1} in all locations except Benerpota (6.8 mg kg^{-1}) and irrigation done with high As containing water (0.24-0.35 mgAs L^{-1}).

Alternate wetting and drying (AWD) and aerobic or direct seeded rice cultivation helped reduce the As uptake by rice plant. Organic amendment and silicon addition also showed a positive result on the lower As uptake by rice plant, however the results were not consistent over the years. Apparently, water hyacinth application reduced the adverse effect of As added at 0.25 mg L^{-1} as irrigation water. The highest level of As was noted in fern collected from Faridpur with the values of 104.7, 78.5 and 64.7 mg kg^{-1} in root, stem and leaf, respectively and the lowest As content recorded with mutha having 16.7, 11.5 and 8.9 mg kg^{-1}, respectively. However, phytoremediation may not be an effective means of reducing As toxicity; growing of non-food crops (e.g. jute, cotton), less water using crops and development of low As accumulating rice varieties could be the sustainable and effective strategies of overcoming this situation.

Coordinated Project on Assessment of Land Productivity and its Enhancement through Utilization of Surface Water in Coastal Area: The project was executed by SRDI and On-Farm Research Division, BARI during 1 September 2010 to 31 December 2013. The SRDI component was assigned to monitor the salinity of selected river water in sough Bengal, to carryout experiments on crop production by raised bed method using harvested rain water, and to determine the extent of salt accumulation in soil by using different strength of saline water. The SRDI monitored the water salinity of rivers in greater Khulna, Jessore, Faridpur, Barishal, Patuakhali, Noakhali and Chittagong districts. A total of 7865 river water samples were collected from 121 sites during February 2011 to October 2013. In greater Khulna district most of the rivers remain non-saline during July to December except Daratana, Kakshiali, Morichan and Sibsha. The water salinity of Daratana, Kakshiali, Morichan and Sibsha rivers remain high to very high saline throughout the year. In the greater Jessore district, all rivers remain non-saline throughout the year except Kapatakkho, Nabaganga and Chitra. Kapatakkho and Nabaganga river water remain saline from March to June, Chitra river water remains saline only in the month of June. All the river waters from greater Faridpur districts remain non-saline throughout the year. In greater Barishal district, all river water remains non-saline from July to December except Shabazapur and Bolesware river (Pirojpur river). The water salinity of Shahbazpur river near Charfession and Bolesware river (Pirojpur river) starts to increase in the month of December and ends at June. In greater Patuakhali district, all river water remains non-saline throughtout the year except Bolesware river, Buriswar (Payra) river, Pakhimari khal, and Andermanik river. Water salinity of Bolesware iver, Buriswar (Payra) river, Pakhimari khsl snf Snfrtmsnik tibrt dystyd increasing from December and ends at June. In greater Noakhali district, all rivers remain non-saline throughout the year except Noakhali khal, Bulua, Choto Feni, Chilonoia started to increase from Nov to December. In greater Chittagong district, all river water remains non-saline throughout the year except Sangu and Karnafulli river. Sangu river water remains saline throughout the year. But water of Karnafulli river at Amanat Shah Bridge remains saline from Nov to June but in places remain non-saline throughout the year.

The scientists of SRDI grew T.Aman (BR23) during Kharif II season and sweet gourd during Rabi season

at Batiaghata sites of Khulna district. The yield of T.Aman and sweet gourd were 5.7 tha^{-1} and 32.0 tha^{-1}, respectively. Experiment on micro-plots over three years showed that soil salinity increased considerably by using irrigation water with increased strength of saline water. The increase in soil salinity was more in surface soil than the sub-soil.

The On-Farm Research Division, BARI carried out adaptive trials different upazilas of Khulna and Noakhali districts during 2010-2013. The adaptive trials were on screening of different crops in saline soils, crop production through mulching, integrated nutrient management for crops and increase in crop productivity through intercropping. The crops were irrigated with the surface water of kuni, small ponds and canals harvested during the rainy months.

The salinity levels of irrigation water at experimental sites of Khulna varied from 1.5-1.98 dsm^{-1} and that of Noakhali ranged from 1.45-195 dsm^{-1}. Soilo salinity levels in experimental sites of Khulna ranged from 2.0-11.25 ds/m and from 2.19-9.5 dsm^{-1} in Noakhali sites. Soil salinity of borth locations was the highest in the month of April-May. Improved varieties of wheat, onion, garlic, bitter gourd, cabbage, cauliflower, tomato, mungbean, water melon and sesame showed better performance than the existing local varieties in Khulna sites. Improved BARI varieties of mustard, linseed, sweet potato and soybean produced higher yields than the existing varieties at different sites of Noakhali district. The use of mulch with rice straw and rice chita showed beneficial effects on the yield of okra. Integrated nutrient management with cowdung and chemical fertilizers showed higher yield of water melon than with the chemical fertilizers alone. Introduction of different crops during the Rabi and Khalif I season increased the cropping intensity, crop productivity and income of the farmers. Improved cropping patterns with promising crop varieties showed better performance in terms of both economy and production over existing cropping patterns.

Updating of Fertilizer Recommendation through Interpretation of Research Results Generated by the NARS Institutes: Bangladesh Agricultural Research Council (BARC) is mandated to publish and periodic updating of Fertilizer Recommendation Guide (FRG) at 5-year intervals. Meanwhile, five FRGs have been published in 1979, 1985, 1989, 1997 and 2005; and the FRG-2012 is the sixth one. The Guide has been prepared mainly for use by the extension personnel; nevertheless it would be useful to all levels of stakeholders involved in agricultural production system.

This Guide has been prepared with the relevant information generated by the National Agricultural Research System (NARS) institutes since publication of the last Guide (FRG-2005). Information of soil fertility status of different agro-ecological zones (AEZs) has been obtained from SRDI that of fertilizer recommendation for crops from different research institutes & universities. The information of the existing cropping patterns at the farm level have been provided by the DAE, BARI and BRRI. All these information have been synthesized to produce the FRG-2012.

The present (FRG-2012) has two parts, text part and fertilizer recommendation part. The text part covers theoretical aspects of plant nutrition, soil fertility and fertilizer management, soil organic matter management, land degradation, rationale of fertilizer use, quality control of fertilizers etc. In the "quality control of fertilizers" qualitative analysis of fertilizer samples practicable at the farm level using some locally available materials has been described. The fertilizer recommendation part comprise fertilizer recommendation for individual crops, cropping pattern based fertilizer recommendation for different AEZs and fertilizer recommendation for multiple cropping.

With a view to increasing crop production and in compliance with the Govt. policy to attain self sufficiency in food, fertilizer recommendation in this guide has shown high yield goal (HYG) with target. A total of 157 recommendations have been made for different cereal, fibre, pulse, oilseed, root, tuber vegetable, spice, fruit, plantation, flower and fodder crops. Flowers and fodder crops have been newly added to this Guide because of growing demand of flowers and growing commercial dairy farms in the country. Regarding cropping patterns, fertilizer recommendation has been made for a total of 294 cropping patterns. Efforts have been made to cover all the major cropping patterns existing at the farm level in different AEZs of the country. Besides, fertilizer recommendation has also been made for a total of 23 multiple croppings commonly practiced in the country.

Development of Nitrogenous Bio- fertilizer for Sugarcane with free-Living and Associative Bacteria Using Biological Nitrogen Fixation (BNF) Technology: Bacteria use nitrogen from the atmosphere to produce nitrogenous compounds that feed plants, so the crop receives the nutrients it needs with increased sustainability and at a lower cost. Using nitrogen-fixing bacteria as a bio-fertilizer in sugarcane in different countries has had varying results to date. Keeping in mind, 3 years sub-project was undertaken entitled 'Development of nitrogenous

bio-fertilizer for sugarcane with free living and associative bacteria using biological nitrogen fixation (BNF) technology' with the objectives of i) screening out suitable sugarcane genotypes favored with biological N_2-fixing system (BNF) under N-stressed condition, ii) isolation, identification and characterization of nitrogen-fixing bacteria, iii) creation of research facilities in the laboratory and iv) improvement of sugarcane productivity with integrated use of N-fixing bacteria and inorganic fertilizers.

A series of field experiments were conducted at Bangladesh Sugarcane Research Institute farm, Ishurdi during 2009-10, 2010-11 and 2011-12 cropping seasons to screen out sugarcane varieties/clones endowed with biological nitrogen fixation (BNF) without application of nitrogen fertilizer. In the first year (2009-10), clone CO 846 showed the highest yield of 101.20 t/ha and in the second year (2010-11) clone B 34-104 produced the highest yield of 127.9 tha^{-1}. In 2011-12 cropping season, clone B 34-104 was cultivated as plant and ratoon cane and produced the highest yield of 114.2 and 77.13 tha^{-1}, respectively. The sugarcane clones of CO 846 and B 34-104 were produced the highest yield without application of urea fertilizer that might have the ability to fix atmospheric nitrogen through BNF.

Simultaneously, two endophytic bacteria were isolated from the stem and leaf sheath of sugarcane variety Isd 37 and clone B 34-104. Molecular identification results from 16S rRNA analyses of these bacteria were also corroborated by morphological and biochemical data; showed that the strains were belonging to species of *Klebsiella pneumoniae* and *Pantoea agglomerans*. Ability to fix nitrogen was verified by the acetylene reduction assay and the variation of nitrogenase activities were found in 6.98 to 7.60 nmol $C_2H_4hr^{-1}$ $culture^{-1}$. The highest nitrogenase activity found in the type strain *Klebsiella pneumoniae;* was 7.60 nmol $C_2H_4hr^{-1}$ $culture^{-1}$. Diazotrophic strains were assessed for plant-growth-promoting trait such as indole acetic acid (IAA) production. The highest IAA production was found in *Klebsiella pneumoniae* that was 62.0 μgl^{-1}. The combined effects of nitrogen fixation and plant growth promotion potential of these diazotrophs would be useful for the development and industrialization of bio-fertilizers.

Other Activities

Scientists of Soils unit worked as the members of the following committee-

- Agriculture and Food Committee of BSTI
- Fertilizer and Allied Products Committee of BSTI
- Fertilizer Distribution Committee of BCIC
- Steering Committee for Establishment of Laboratory of SRDI
- Project Management Committee of Soil Resources Management and Strengthening Farmers Services Project.
- Evaluation of SPGR Sub-projects under Soils and Water management.
- কৃষি জমির উর্বরতা সংখ্যার কৌশল নির্ধারণ বাস্তবায়ন ও পরিবীক্ষনসহ গুণগত মানসম্পন্ন সার ব্যবহার নিশ্চিতকরণের লক্ষ্যে গঠিত সাবটেকনিক্যাল কমিটি।
- Member Secretary of Tender Evaluation Committee (TEC) for Procurement of Lab Equipment for NARS Institutes by PIU- BARC, NATP Phase -1.
- Member Secretary of Proposal Evaluation Committee (PEC) for National and International Consultant under PIU-BARC: NATP Phase-1.

As the members of these committee scientists of Soils Unit regularly attended the meetings and contributed with comments, opinions and suggestions.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Research Management/Financing and Coordination

i) "Potentialities of Major Fruits Farming and Marketing System and Price Behavior in Hill Region of Bangladesh". Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.

ii) "Assessment of Socio-Economic Impacts of Pulses Research and Development in Bangladesh". Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.

iii) "Assessment of Socio-economic Impacts on Oilseeds Research and Development in Bangladesh". Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.

iv) "Consequences of Tobacco Cultivation in Bangladesh". Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.

v) Marketing and Value Chain System of Brackish Water and Marine Fisheries Products and By-products in Bangladesh. Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.

vi) Integrated farming and its impact on farmers' livelihood in Bangladesh. Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.

vii) Comparative Study on IPM and Non-IPM Technology in Selected Vegetables Growing Areas of Bangladesh". Sponsored Project Grand Research (SPGR), PIU-BARC, NATP phase-1.

Policy Level Contribution

Policy oriented comments were sent to the Ministry of Agriculture according to their needs/requirements. Some of those are as follows:

- Comments of BARC on ÒIDB Group Member Country Partnership Strategy (MCPS) andCountry Economic Work (CEW) for Bangladesh Draft reports
- Inputs/Suggestions for the D-8 Summit, held in Islamabad, Pakistan during 19-22 Nov 2012.
- Inputs/Suggestions for the "28th Session of the Standing Committee for Economic and Commercial Cooperation of the Organization of the Islamic Cooperation (COMEC)" to be held in Istambul, Turky during 8-11 October 2012.
- Comments of BARC on "Guidelines on Agent Banking for the Banks" - prepared by Bangladesh Bank.
- Comments of BARC on "Agricultural and Rural Credit Policy, 2013-14".
- Comments of BARC on "Microcredit Market, Policy".
- Comments/Inputs of BARC on Implementations of Provisions of the Istanbul Programme of Action.
- Inputs/Suggestions for the "First Draft of Brief for the upcoming 9th session Bangladesh – Pakistan Joint Economic Commission Meeting proposed to be held in Islamabad on 28-29 January, 2013.
- Comments of BARC on Agreed Minutes (Serial 'g') of the 6th Joint Trade Commission Meeting between Myanmar and Bangladesh.
- Comments of BARC on "Post-2015 Development Agenda."

Monitoring, reviewing and evaluation report of programs/activities of NARS Institutes

A three member monitoring team was formed to observe the progress of the SPGR Sub-Projects conducted by different research institutes. The team leader and member was Dr. S M Khalilur Rahman, Member Director (AERS), BARC, Dr. Md. Abul Kashem, Director (TTMU), BARC, and Mr. Dipak Kumar, Monitoring Officer, PIU-BARC, respectively. This team monitored the progress of activities of 34 projects (including 17 crops, 5 Agril. Engineering , 3 Livestock, 3 Fisheries, 2 Agro-forestry, 2 Socio-economic and 1 GIS related project).

Another three member monitoring team was formed to observe the progress of the SPGR Sub-Projects conducted by different research institutes like BARI, BLRI, BFRI and University of Chittagong. The team leader and member was Mr. Abeed Hossain Chowdhury, Director (Comp. & GIS), BARC, Dr. A.S.M. Anwarul Huq, CSO (AERS), BARC and Dr. Md. Abdus Salam, PSO (P&E), BARC respectively. This team monitored the progress of activities of the following projects.

	Sub-Project Title	PI
1	Integrated Crop Management for the Improvement of Jackfruit	Dr. M. A. Rahman, CSO (Pathology), HRC, BARI, Gazipur
2	Sustainable management of available water resources of unfavorable hill ecosystem	Dr. Md. Mohabbat Ullah, CSO, Hill Agril. Research Station, BARI, Khagrachari
3	Coordinated Project on Improvement of Agro-forestry Practices for Better Livelihood and Environment: BFRI (Forest) Component	Dr. Shaheen Akhter, CSO (Management Branch), Bangladesh Forest Research Institute, P.O. Box- 273, Chittagong
4	Coordinated sub-project on Farming System Research and Development for Farmer's Livelihoods Improvement: BFRI Component (Hill Ecosystem)	Dr. Shamila Das, Divisional Officer, Bangladesh Forest Research Institute, P.O. Box- 273, Chittagong
5.	Coordinated Project on improvement of agroforestry practices for better livelihood and environment: CU Component	Professor Dr. M. Jashimuddin, Institute of Forestry and Environmental Sciences, University of Chittagong, Chittagong

6.	Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns: SSD, BARI Component	Dr. Md. Azizul Haque, PSO, Soil Science Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur,
7.	Coordinated sub-project on water management for enhancing crop production under changing climate: BARI component	Dr. Pijush Kanti Sarkar PSO and Head, IWM Division BARI, Gazipur
8.	Coordinated Sub-project on Farming System Research and Development for Farmers' Livelihoods Improvement: BLRI Component	Dr. Md. Mafizul Islam, Principal Scientific Officer, Bangladesh Livestock research Institute, Savar, Dhaka
9.	Consequences of Tobacco Cultivation in Bangladesh	Dr. Tanvir Mahmud Bin Hossain,SSO, Agricultural Econ. Division, BARI, Gazipur

Resesrch Highlights of NARS Institutes

Agricultural Economics Division, BARI

BARI 1

Export and Import Parity Analysis of Selected Vegetables and Spices in Bangladesh: Value addition was found positive for all vegetables and spices producers studied. However higher value addition was estimated for bitter gourd producers (Tk 1,52,145/ha) followed by pointed gourd producers (Tk 1,33,396/ha). Comparatively lower value addition was calculated for garlic producers (Tk 99,352/ha) than onion producers (Tk 1,22,308/ha). On the other hand higher value addition was calculated for vegetables exporters of Tk 57,173/ton at UK and Tk 45,798/ton at Middle East followed by vegetables suppliers (Tk 3270/ton). Highest benefit cost ratio was calculated for garlic (1.8) followed by pointed gourd (1.7), bitter gourd and onion (1.6). The estimates of DRC showed that Bangladesh had comparative advantage in bitter gourd and pointed gourd production as the estimates of DRC were less than one investigated and DRC for onion and garlic were also less than unity implied that the production of onion and garlic would be highly efficient for import substitution.

BARI 2

Adoption and Profitability of Oilseed Cultivation in Bangladesh: The overall adoption status revealed that 40.2% mustard, 17.6% groundnut, 21.5% sesame and 15.6% soybean farmers adopted improved variety at farm level. The areas planted the improved varieties were 28.5% for mustard, 6.7% for groundnut, 11.6% for sesame, and 7.3% for soybean. The common factors that significantly influenced farmers to adopt improved variety were no. of family labour, availability of HYV seed, farmers' cosmopolitness, and extension contract. Oilseed cultivation at farm level was very much remunerative to its growers since they received Tk 28859, Tk 84200, Tk 13879, and Tk 3761 as net return from mustard, groundnut, sesame, and soybean cultivation respectively. The profitability of improved oilseeds production was significantly higher compared to local variety. Again, the highest BCR (2.36) was estimated for groundnut cultivation followed by mustard (1.56), sesame (1.3), and soybean (1.1). However, the cultivation of oilseeds in the country is much more beneficial than their importation from foreign countries since the value of DRC is lower than unity. Most respondent farmers (49-86%) wanted to increase oilseed cultivation in the next year. The reasons behind their interest were receiving higher yield, low cultivation cost, high profit, and needs less labour.

BARI 3

Tobacco Cultivation and Contract Growing System in Bangladesh: Farmers were highly motivated to cultivate tobacco because tobacco industries provide various kind supports to the farmer like capital, seed, technology, confirm and cash purchase. Freelance farmers also cultivated tobacco from hereditarily. Though tobacco cultivation give a good profit but farmer also mentioned that it requires more labour and production cost. For this reason, many farmers mentioned that if they will not get any support by the industry then they will shift to cultivate other profitable crops. Most of the farmers realized that tobacco cultivation is harmful for the health and the society as well. Therefore, if the government manage and encourage the agro-based industry to give same kind of support through contract growing system to the farmers than farmer will stop tobacco cultivation and switch to cultivate other crops like maize, wheat, potato and vegetable.

BARI 4

Adoption and Profitability of Wheat Varieties in Some Selected Areas of Bangladesh: The results indicated that Shatabdi was highly adopted wheat variety (46%) followed by Prodip (19%), Bijoy (17%), Kanchon (7%) and Sonalika (5%).The adoption levels of ploughing, manure & fertilizer use were low, whereas planting time and irrigation were high. The cost of producing Shatabdi was highest (Tk

67209/ha) followed by Bijoy (Tk 62744 /ha), Prodip (Tk 62351/ha), Sonalika (Tk 61105/ha) and Kanchon (Tk 55650 /ha) varieties of wheat due to higher cost of human labour, land preparation, seed and irrigation cost. The yield of Shatabdi was highest (4.27 t/ha) followed by Prodip (4.10 t/ha), Bijoy (3.98 t/ha), Sonalika (3.62 t/ha) and Kanchon (3.42 t/ha). The net return of Shatabdi was highest (Tk 34987/ha) followed by Prodip (Tk 34467/ha), Bijoy (Tk 31917/ha), Sonalika (21321/ha) and Kanchon (Tk 19895/ha). The net return of wheat was higher than its competing crops like lentil and mustard and lower than potato and maize. Human labour, land preparation, seed, fertilizers and irrigation had positive and significant effect on wheat cultivation. Lack of seed at proper time, technical knowledge about improved cultivation practices of wheat, high price of fertilizer, and low price of wheat were the major constraints for the adoption of wheat technologies.

BARI 5

Economic Impact of Shifting of Land Under Cereal Crops to Jujube Cultivation in Selected Areas of Bangladesh: A total of 120 farmers out of which 40 from each district were selected randomly for the study. The total costs of jujube cultivation were Tk 2,77,232 in the 1st year, Tk 2,69,591 in the 2nd year, Tk 1,90,217 in the 3rd year, and Tk 179612 in the 4th year. The average yields of jujube were found highest in the 4th year (19743 kg/ha) followed by 3rd year (17,203 kg/ha) and 2nd year (12055 kg/ha). The net returns from jujube cultivation were Tk 1,37,314 in the 2nd year, Tk 467744 in the 3rd year and Tk 487380 in the 4th year. The undiscounted benefit cost ratio (BCR) on full cost and variable cost were estimated to be 1.93 and 2.67 respectively. The total cost of jujube cultivation were 50-62% higher than the costs incurred for different cropping patterns in the study areas. The net return from jujube cultivation were on an average 71% higher than the different cropping patterns in the study areas. The shifting of cereal lands to jujube cultivation was found to be a highly profitable enterprise since the BCR (1.8), net present value (Tk 6,51,542), and internal rate of return IRR (88%) of jujube cultivation was very high.

BARI 6

Study on Rural Households' Food Security in Coastal Region of Bangladesh: The study focused on the status of food security and its determinants among coastal people in the study areas. It also identified their livelihood risks and coping strategies during stressed situations. The study based on a sample of 450 coastal households revealed that most of the households (51%) were food secured whose calorie intake (2788kcal/capita/day) was much higher than the national average (2318 kcal/capita/day). Among various food items, rice supplied 71.31% of the total daily calorie intake of food secured households followed by edible oil (7.76%), sugar (5.77%), potato (3.70%), vegetables (3.48%), pulses (2.46%), and spices (1.33%). Logit model revealed that farm land size, farm income, off-farm income, and household crop production had positive and significant impact in attaining food security of the coastal households. Besides, small households and the households with more earning member were more food-secured than large ones. Flood, heavy rainfall, reduction of land productivity, crop damage by rat, lack of modern technology, salinity problem and high price of inputs were found to be livelihood risks for the coastal households.

BARI 7

Adoption and Impact of IPM Technology on Sweet Gourd Production in Some Selected Areas of Bangladesh

The study was undertaken to examine the adoption of IPM practices on sweet gourd production in Jessore, Magura, Comilla and Bogra districts during 2012 to assessed the impact of IPM on pesticide use, yield and producer profits of sweet gourd farmers in Bangladesh. The yield of sweet gourd was found 20.10 t/ha and 18.20 t/ha in IPM and Non-IPM farmers respectively. The cultivation of sweet gourd was profitable since BCR were 2.17 for the IPM and 1.93 for Non-IPM farmers. Gross return and gross margin of IPM practices were 10% and 20% higher than Non-IPM farmers respectively. Farmers in the study areas adopted IPM practices as most of the farmers were influenced by IPM school. IPM farmers mainly used sex pheromone traps, soil amendment and hand picking. Trend in area of IPM practices were increasing over the last three years. Most of the farmers (84%) showed positive attitude towards IPM practices in sweet gourd cultivation in future. The use of traps and other IPM practices in sweet gourd cultivation was found very effective in reducing insect infestation.

BARI 8

Constraints to Access Credit and its Impact: A Study on Farm Households: A total 180 farmers of which 30 credit users and 30 non credit users from each three districts were selected. The study revealed that highly responded constraints for bank credit were cumbersome procedure (83%), late disbursement of credit (62%), requirement of adequate collateral

(61%). High interest rate, short term and small amount of credit were highly responded constraints for credit from NGOs and local money lenders. The impact of facing these constrains of access to credit created a lot of troubles to get credit such as hamper in agricultural activities (59%), increase cost of credit, and sell agricultural crops at low price to manage the money of every installment. Having off farm income, membership of any institution, adequate collateral and effective references were significant determinants to increase probability of access to credit. Access to credit from formal institute may increase through improving credit disburse system for hassle free quick, and timely sanction of credit.

BARI 9

Existing Vaule Chain Assessment of Chilli Marketing in Selected Areas of Bangladesh: It was observed from the study that green chili cultivation is profitable and per hectare net return is Tk.92,250 and BCR is 1.64 and the per hectare net return from dry chilli is Tk.1,02,853 and BCR is 1.67. The net value addition per quintal of green chilli at farm level was Tk.1105.25 and highest value addition at intermediaries' level was Tk.333 for Retailer (Dhaka). The post-harvest loss of green chilli was highest at retailer (Dhaka) level which was Tk.180 per quintal. The overhead processing and marketing cost of agro-processing industry (BD foods ltd.) was Tk.3522 per quintal of dry chilli which was highest. The post harvest loss of dry chilli was highest at agro-processing industry (BD Foods Ltd.) level which was Tk.2497per quintal its due to dry loss, milling loss and shortage. The net value addition per quintal of dry chilli was highest for agro-processing industry which was Tk.4231. Seasonal price variation showed that price of green chilli was minimum in the month of April which was due to late harvesting period and maximum in the month of August which might be due to non availability of green chilli. On the other hand price of dry chilli found to be minimum in May and maximum in January.

BARI 10

Assessment of Socioeconomic Impacts of Pulses Research and Development in Bangladesh: The total sample size was 2700 farmers. The areas of lentil, mungbean, blackgram, chickpea and khesari were increased significantly during the pre adoption period whereas, in post adoption period the growth rates of areas different pulses decreased significantly. Pulses areas are being replaced by the area under Boro rice, wheat, and mustard due to their high yield potential and better economic returns. These might be the reasons for negative growth rate of pulses. Area instability of mungbean (15.852) was the highest in terms of instability index followed by blackgram (8.780), Khesari (7.665), and chickpea (6.214) during pre adoption period. But in the post adoption period highest instability was found in blackgram (10.370) and lowest for khesari (2.718). In 2011-12, improved pulses like lentil, mungbean , blackgram chickpea and khesari occupied 93%, 100% 48%, 72%, and 3% of the total pulses area in Bangladesh. The adopters of improved lentil, blackgram and khesari got 68%, 46% and 31% higher yield over their corresponding local varieties respectively .On the other hand, there was no local variety of mungbean in the study areas. The DRCs for lentil, mungbean, blackgrame and khesari were observed to be less than unity. The infestation of different insects was a common constraint in pulse cultivation. High harvesting cost was reported as a problem by the mungbean farmers.

BARI 11

Documentation of Insecticides' Use on Brinjal and Okra in Manikganj and Chittagong Districts: This study has been undertaken to know the real situation at the field level and suggest some policy directions. The study has been conducted in Chittagong and Manikganj districts. A total of 120 farmers, 30 from each district for each vegetable crop, namely brinjal and okra were selected randomly. All the respondent farmers, except one, were found to have used insecticides and pesticides. It is a deep rooted belief of the farmers that there is hardly any yield found without using insecticide. As many as 32 and 25 insecticides were used by the farmers for brinjal and okra, respectively. Detrimental effect of the insecticides to the human body was more or less admitted by the respondent farmers. Not a single farmer was found having any idea about pre-harvest interval of the insecticides. If any of them maintained, maintained it deliberately. It's a common practice of the farmers that for the next harvest they apply insecticides at the following day of the previous harvest. The average success of applying all the insecticides to control insects was more or less ranged from 50% to 100%. For judicious use of insecticide farmers' dependency on SAAO not on dealers, knowledge on pre-harvest interval of insecticides both for farmers and SAAO as well, ethical development of the farmers, biological and cultural method to control insects etc should be ascertained.

BARI 12

Potentialities of Major Fruits Farming, Marketing System and Price Behavior in Hill Regions of

Bangladesh: The survey results indicate that the people of hilly areas are mostly illiterate (74%) and majority of them can sign their name only (46%). The overall literacy rate in hill regions are estimated at about 26% in compare with the national average of 58.4%. The average family members were 5.42 persons per family (national average being 4.85). The average farm size was 1.75 ha/farm and the average fruit garden was estimated to be 0.81 ha/farm, which was about 46% of total land allocated for fruit cultivation in all locations. The average per capita incomes (Tk 45420/annum) of the hill areas were lower than those of per capita income of national average (Tk 57652/annum). It is mentionable that 28% of the CHT comprises high hills, 22% medium high hills, 31% low hills and the remaining 19% is valley land. The average cropping intensity of hilly areas was 153% with the highest cropping intensity at Khagrachari (189%) and the lowest at Bandarban (131%) with a national average of cropping intensity 181%. Farmers obtained 11%, 50%, 23%, 25%, 21% and 29% less yield for mango, jackfruit, litchi, banana, orange and pineapple cultivation in compare to the research managed yield in the study areas. The use of human labour, fertilizers and management practices had significantly influenced upon better yield in all most all study areas. The partial project analysis indicated that BCR is greater than one, NPV is positive and IRR is greater than opportunity cost of capital for all fruits cultivation. High price variation was observed in between the accessible and the less-accessible areas. In 2012, the average ranges of price variations for mango, jackfruit, litchi, pineapple, banana and orange in accessible areas were 1-9%, 3-8%, 22-34%, 3-13%, 5-19% and 7-13% higher than those of less accessible areas. Awareness of the farmers should be developed through providing training for proper utilization of the input factors for optimum yield. Scarcity of ground water, storage facilities, transportation facilities, lack of agro processing industries and low prices were identified as the major constraints in the hill areas of Bangladesh.

HRC, BARI 1

Comparative Profitability of Bean and Cucumber Production in Some Selected Areas of Bangladesh: The average yield of bean and cucumber were found to be 20.38 and 21.50 t/ha, respectively. Human labour cost was the major cost items for cultivating these corps. The net return was found to be Tk 167466 for bean and Tk 215857 for cucumber cultivation. The average benefit cost ratio over variable cost was 1.69 and 1.83 for bean and cucumber respectively.

Agricultural Economics Division, BRRI

BRRI 1

Farm Level Evaluation of Modern Rice Cultivation in Bangladesh: Modern rice varieties covered almost 97% of the total Boro area in 2011-12. BRRI varieties covered 74% area. BRRIdhan28 and BRRIdhan29 were the dominant varieties covering 33 and 31% area respectively. In Aus season, modern rice varieties covered about 72% while the coverage of BRRI varieties was 43%. BRRIdhan28, BR2 and BR1 were the dominant varieties covering 15, 7 & 3.68 percent area respectively. In T. Aman season, the coverage of MVs was 70% of which BRRI varieties covered 44%. BR11 was the prominent variety covering 22% area. Average yield of MV Boro, T.Aman and Aus were 5.04, 3.58 and 3.49 t/ha respectively.

BRRI 2

Estimation of Costs and Return of MV Rice Cultivation at Farm Level: Per hectare human labor costs were Tk 37766, Tk. 36329 and Tk 44246 for MV Aus, MV T.Aman and MV Boro rice cultivation, respectively. Irrigation costs of MV Boro and MV Aus were Tk 13986/ha and Tk 2086/ha respectively. The yield were 3588 kg/ha, 3956 kg/ha and 5509 kg/ha from MV Aus, MV T. Aman and MV Boro crops, respectively. Farmers received Tk.82035/ha, Tk. 74250/ha and Tk. 56252/ha gross return from MV Boro, MV T. Aman and MV Aus, respectively. Net returns were Tk. 21550/ha, Tk. 3892/ha and Tk.12977/ha for MV Boro, MV T. Aman and MV Aus respectively.

BRRI 3

Hybrid Rice Technology and Its Sustainability at the Farm Level: Area under hybrid rice has been declining in all districts over the period, 2002-2011. Area under BRRIdhan29 and other MVs has been fluctuating over the same period. Although, the yield performance (about 7.00 t/ha) of hybrid rice and MVs varied in different districts, the yield of hybrid was higher than BRRIdhan28 (5.00 t/ha) and BRRIdhan29 (6.00 t/ha). The higher yield of hybrid resulted to lower unit cost of production compared to MVs in all districts. Mean difference in all types of costs and return of hybrid and MV rice varieties were statistically significant at 1% level. Result of tobit analysis indicated that contact with the extension service and participation in training was positively significant in continuation of hybrid rice cultivation.

BRRI 4

Long term growth analysis of food grains in Bangladesh: During the period of 1971-72 to 1983-84, the growth of area for Aus, Aman and Boro showed declining trend; while the growth of production showed increasing trend, and this upward trend was due to rapid dissemination of developed modern varieties. However, input subsidy introduced by government resulted to enhance food grain production. Significant differences were observed in the area, production and yield of different cereal crops during two periods "pre and post establishment of BRRI". This change defined as structural changes and it was also observed during 1984-85 to 2009-10 due to structural reform introduced by World Bank and input subsidy program by the government of Bangladesh.

BRRI 5

Socio-economic assessment/validation of rice technology needed for the farmers in the project areas: In southern region, major cropping patterns were Rabi/Khesari-T.Aus-T.Aman, Rabi-Fallow-T.Aman, Fallow-T.Aus-T.Aman and Boro-Fallow-Fallow, indicating there is a lot of scope to grow rice and other crops in the Boro and Aus seasons. Whereas the major cropping patterns in northern region were Boro-Potato-T.Aman, Boro-Fallow-T.Aman, and Tobacco-Jute-T.Aman. The farmers of Barisal region need mainly insect, disease resistant and longer seedlings varieties along with harvester, transplanter, applicator of USG, dryer etc; while the farmers of Rangpur region need mainly insect, disease and drought resistant varieties with long seedlings harvester, transplanter, USG applicator and dryer.

BRRI 6

Effect of Rice Based Technologies on Farm Income under Changing Climate in Drought-Prone Areas (Rajshahi) of Bangladesh: All the technology users reported that they were very enthusiastic to use the given variety for next season. It was found that the average volume of sale of Aman paddy (1.09 ton) was higher after the project intervention compared to than that of (1.69 ton) before the project. Average production of Boro was lower in 2011 (4.08 ton) compared to than that of (5.03 ton) in 2010 due to cold and drought problem. Almost all the producers reported that the seed quality was very good compared to the traditional seed. However, the T. Aman growers received higher gross and net return (Tk. 21339/ha and Tk.8365/ha) after project intervention.

Bangladesh Sugarcane Research Institute

BSRI 1

A Study on Production and Marketing of *Gur* in Selected Areas of Bangladesh: Per hectare yield of sugarcane production in mill zone and non mill zone area were 73.17 and 85 ton respectively. Average sugarcane production cost in mill zone was Tk.1,05,137/ha and total return was Tk. 1,96,767/ha. A farmer when he sales his product then he received more returns (Tk. 2,22,890/ha). Benefit cost ratio achieved from sugar mill and *gur* maker are 1.87 and 2.12 respectively. On the other hand, production cost and total return of a *gur* farmer was Tk.1,65,137/ha and Tk.3,80,632/ha respectively. Benefit cost ratio of a *gur* farmer was 2.29. The benefit cost ratio of a *gur* maker was 1.58. Production cost of gur farmer and gur maker is Tk.20.50/kg and 32.16/kg respectively. On the basis of the intermediaries five marketing chain were identified as a dominant. The gur farmer/gur maker-Arratdar/Foria - Paikar-Retailar-Consumer was identified as a most dominant client. *Gur* production is more profitable compare to supply to the sugar mills. The farmers are interested to produce gur or sale sugarcane to the *gur* maker. The study suggested to create facility to storage gur and established the organization of *gur* board to solve problems of *gur* farmers.

BSRI 2

Trend and Growth of Sugarcane Production In Bangladesh: In mill zone negative and significant growth rate was found of sugarcane area and price. But it was positive significant at 5% level in sugarcane yield. In overall sugarcane area was negative and significant also but yield was positive and significant at 1% level. It is concluded that to increase the sugarcane area, sugarcane price should be increased.

Bangladesh Institute of Nuclear Agriculture

BINA 1

Economics of Binadhan-5 (Boro Rice Variety) Cultivation in Bangladesh: On an average, cost of production was Tk. 24,671. This is due to higher amount of human labor specially hired labor and power tiller needed for Binadhan-5 cultivation. It was found that Gross returns, the sum of the value of paddy and straw, were Tk. 45,709 per hectare. The cost of production was found highest in Brahmanbaria (Tk. 29,732) followed by Sylhet, Sherpur, Satkhira and Bhola, and lowest in Rangpur (Tk. 15,556) due to high price of hired human labour. On the other hand, gross return was highest in Sherpur (Tk.48,182) followed by Rangpur, Satkhira, Brahmanbaria and Sylhet, and lowest in Bhola (Tk. 44,308). The farmers of all locations achieved 6.1

t/ha average yield of Binadhan-5 and net returns were Tk.21,037 per hectare. On an average, the benefit cost ratio was 1.85, which means that Binadhan-5 growers benefited of Tk. 1.85 for each Taka spent.

BINA 2

Participatory Variety Selection (PVS) for Binadhan-8 (a saline tolerant rice variety): Binadhan-8 achieved the highest vote and line P19S8 scored the second highest vote followed by P24P2. Binadhan-8 provided the highest yield (4.53 t/ha), followed by P24L2, P1L2, P29S7, P19S8, P1L3, P25S1, P27S5, P36S5 P1L3. Though the farmer's preference was high, the yield of line P19S8 was not satisfactory as the grain quality was not so good. Check variety Binadhan-8 performed well with highest yield (2.08 t/ha) and got all 30 positive votes from farmers. Two lines P25S1 and P24L2 drew almost similar number of farmer's attention at Kaligonj. It was found that, correlation among mother trial of salt tolerant line at Kaligonj was positively significant. Correlation between male and female farmers was high followed by farmer and researchers, farmers and yields. It was observed that Check variety Binadhan-8 exhibited its superior performance also at Shyamnagor. Got all 30 positive votes along with the highest 5.0 t/ha yield. In terms of farmer's preference, line P24L2 was the 2nd best among the tested entries. It could be concluded from the finding that Binadhan-8 exhibited the utmost performance in all studied area. Yield of Binadhan-8 were 5.00, 4.53, 2.089 t/ha shyamnagar, labanchara and Kaligang upazilla, respectively which was the highest production among other variety. Therefore it could be expanded in the saline areas of Bangladesh.

COMPUTER AND GIS

Computer and GIS unit of BARC is involved in overall ICT management of BARC in view of hardware, software, networking etc. and plays a vital role to establish ICT infrastructure and facilitate ICT and MIS related activities/services among NARS institutes. With the support of National Agricultural Technology Project (NATP), Computer and GIS unit already established a Data Center at BARC which connects 7 NARS institutes through Virtual Private Network (VPN). The development of MIS for NARS is in progress with NATP support. The MIS system once deployed will help identify skill gap, observe research trend in different sub-sector of agriculture, avoid wasteful duplication, apprehend investment trend and identify research capacity including physical facilities among many advantages.

The activities of the unit also involved in preparing technical specification of procuring computer hardware, software, networking and related goods/accessories, evaluating technical proposal, receiving ICT goods, distributing them among officers and staffs. The unit also provides support for troubleshooting of hardware, software, network, internet/email and related services. In addition to that, the unit conducts various ICT training for the scientist, officer and staff that helps in capacity building of BARC and NARS institutes through ICT enabled human resources. The unit also provides assistance for evaluation of research program in the field of ICT and in recruiting of computer professionals and staffs in BARC and NARS institutes. Geographic Information System (GIS) is another important functional part of the unit. Maintenance, necessary updating and output preparation of AEZ land resources database and local level Upazila Nirdeshika Database (soil, land, nutrition and others) is an on-going activity of this unit. Land suitability assessment and crop zoning was an important outcome of GIS activity. Computer & GIS performed the following activities during the reporting period:

Establishment of MIS-ICT facilities at NARS: In order to enhance the efficiency and effectiveness of the National Agricultural Research System (NARS), establishment of ICT infrastructure and MIS development is being carried out by Computer & GIS unit under NATP support. Computer and GIS unit provided necessary support to PCU-NATP for establishing LAN/WAN facilities at BARC and 7 NARS institutes, VPN connectivity among BARC and NARS institutes. The unit provided necessary support for establishment of Data Centre (DC) at BARC. Also, helped PCU to arrange training program for NARS personnel on Windows, LINUX, Networking and Data Centre operation. During this period, the unit supervised the activities of support personnel deployed by the vendor as part of the contract for hardware and software troubleshooting, maintenance and network management at BARC and NARS institutes.

Regarding MIS development, the inception report on MIS prepared by vendor software firm was reviewed and verified and provided important feedback to PCU-NATP. Attended series of meetings arranged by PCU for validation and finalization of business and system requirement specification documents (BRD and SRS) of MIS and provided important feedbacks upon each of 9 (nine) modules of MIS. The MIS module will cover research management, financial, inventory, human resources, library, procurement,

training, vehicle management, agricultural technology, gene bank related information management. Once the entire system is operational, it will help policy makers, planners, research mangers of NARS organizations to run their day-to-day activity as well as overall decision making in a planned and well-organized way resulting enhancement of institutional efficiency and governance.

Application of GIS for farm productivity enhancement through land suitability assessment of major cropping pattern of Bangladesh (SPGR Sub-project): The main goal of the project is optimization of present utilization of agricultural lands through GIS based technology. However, the objective of the project is to provide information to the farmers on the choice of rotation of their crops that ensures the increase of food production and maximizes the farmer's income. More specifically the project objectives are: 1) Updating and validation of the land/crop suitability database in order to derive appropriate farming practices for sustainable socio-economic condition. 2) Development of a user friendly GIS based tools (software) for land suitability assessment. There are two major components of the special study (a) baseline/benchmark survey of the study area (six upazilas) and (b) development of GIS based tools (software) for land suitability assessment. The activities for the proposed study are given below:

(a) Conduct baseline/benchmark survey of the study area which includes: Collection of primary and secondary data on the surface and ground water resources, seasonal inundation depths and duration, climatic information, soils, landforms, agriculture and socio economic parameters. Satellite imagery need to be acquired and analyzed to gather relevant information of the study area. Development of databases includes: Database on DEM and land type, hydrological/meteorological parameters, Soil and landforms, Agricultural database, Socio-economic database, Crop and land suitability database, Development/Updating of the database of crop suitability through field verification and also utilizing the research findings made by the National Agricultural Research System (NARS) Institutions.

(b) Development of GIS based tools (software) for land suitability assessment includes: Preparation of land type and land use map using DEM data and satellite images, Preparation of soil, land, climate and socio-economic maps, Development of GIS based software for determination of land type, Development of GIS based software for production of Land suitability maps and Field validation of GIS based tools (software) for land suitability assessment.

Based on the major agro-ecological regions of the country both under extensive farming practices as well as vulnerable/potential areas (drought, salinity, water availability, soil condition, cropping pattern, marketing facilities etc.) six upazillas (Dinajpur, Parbotipur; Bagerhat, Mollahat; Tangail, Ghatail and Tangail Sadar; Jessore, Bagherpara and Comilla, Laksham have been selected for the study. The sub-project activity is under progress. Procurement of goods is completed. The hiring of firm and benchmark/base-line survey of the study area has been completed. The development of GIS based tools (software) is under progress.

Establishment of Agricultural technology information network in Asia: Agriculture including fisheries and livestock is the main source of earnings for majority people of Bangladesh and continues to be the mainstay of Bangladesh economy. The use of ICT systems in these sectors is very much essential to reap its unutilized potentials and thereby improving the socio economic conditions particularly of the rural people. Proper initiatives need to be taken to utilize ICT systems in agricultural research, and dissemination of agricultural technology, agribusiness development to the farmers and preparation and maintenance of agricultural databases. This will help strengthen the agricultural information services thereby facilitate quick dissemination of knowledge and experience to different stakeholders. It is needless to say that availability of information on promising agricultural technology and management practices at the doorstep of farmers at right time will have significant impact on the crop productivity resulting improvement of the livelihood of farmers. To materialize this, there is no alternative to ICT to reach each and every farmer with needed information at an appropriate time.

In global context, the development of ICT has proven its potentials for enhancing development efforts, but also virtually reduced the distance and turned the world into a global village. The establishment of web based agricultural technology information network, an initiative taken by AFACI can turn out to be an important gateway for sharing of knowledge and expertise among the member countries and the globe.

In this context, agricultural technology information has been collected and publishing of agricultural technology handbook is complete. Information on agriculture network, technology, AFACI projects uploaded to AFACI website. Besides, the existing

website of BARC is constructed newly (Bangla and English version) using state-of-the-art web 2.0 technology. The website is going to be launched soon.

Maintenance and Updating of BARC Web site: The work is being carried out as a routine job. Various changes are made time to time to make the website more informative and up to date. Various circulars, tender information, notice etc. are uploaded now and then.

Design and development of BTRI and BSRI website: Have planned to procure a new dynamic, bilingual (Bengali and English version) state-of-the-art technology website of BSRI along with BARC website, but due to unavailability of fund the work could not be done.

Sever and Network administration and Internet/ Email management: System Administration for smooth functioning of LAN and Internet/Email services is being done as a routine activity. During this period, necessary support and maintenance has been provided for smooth operation of network and internet/email system. As part of this activity, internet connectivity of 4 Mbps bandwidth with optical fiber is established through BTCL for faster internet speed. Also 16 Real IP is purchased from BTCL for activating various services like server administration, database and application management, antivirus, bandwidth management, video conferencing and so on.

Data Centre Operation: Supervised Data Centre (DC) operation services provided by vendor for smooth running of the system among BARC and 7 NARS institutes.

Climatic & Ground water database: The monthly and historical average of climatic data of 2009, 2010 processed and uploaded to the BARC website. Also acquiring of climate data for the year 2011 and 2012 is under process. However, no progress has been made for ground water database.

Maintenance and updating of existing database: Monthly salary generation sub module of payroll management system is complete. Salary data entered into the system for October, Nov, December-2012 and January-2013. However, some bug is found in the payroll system and fixing of bug is in progress. Development of other sub modules (Loan and Service-end benefit) is in progress.

Research Management Information System (RMIS) is developed. Some modification of RMIS, data gathering and data entry, editing is in progress. Around 3000 project information is incorporated into the system until June 2013.

Personnel Management Information System (PMIS) has been developed to incorporate the PDS requirement by MoA. Information on general, education, training, job history, publication, achievement, leave information etc. are covered by the system. The system has been developed to accommodate personnel information of 13 NARS organizations. Already most of the information of BARC personnel has been entered. Also BSRI, BRRI, BJRI have started entering their personnel information into the system.

During this period, in order to build up online inventory management system with store management, PHP-MySQL based application has been developed. The backlog data entry is in progress.

Continuation of GIS Activities: Maintenance, necessary updating and output preparation of AEZ land resources database and local level Upazila Nirdeshika Database (soil, land, nutrition and others) is continuing as an on-going activity. Crop zoning work is a part of this activity.

Support to BARC and different component of NATP as PEC and TEC member: Necessary support provided to the Proposal Evaluation Committee (PEC), Tender Evaluation Committee (TEC) etc. for procurement of goods, works and services.

Support to Division/Sections of BARC for Hardware/Software; Data analysis; Multimedia presentations; Information Sharing and Resource Management for Hardware/Software: Support provided to different divisions/sections to fix various types of computer hardware and software problems. Several types of maps and data of land resources, climatic and other information have been provided to scientists/researchers/extensionists as per requirement. Word-processing, PowerPoint presentation and other software related support given to different divisions/sections of BARC. These are routine job of the unit.

Support for planning, budgeting and procurement of computer resources (hardware, software & accessories etc.): Prepared annual requirement plan and budget of computer accessories of BARC and provide support for procurement of computer

hardware, software and other accessories. Support provided for procurement of computer accessories under BARC and computer hardware, software and accessories under different projects i.e. NATP and KGF.

Field Monitoring of Programs/Activities

As a team leader, Md. Abeed Hossain Chowdhury, Director, Computer & GIS unit monitored the progress of activities of the SPGR sub-projects. As a team member of monitoring team formed by Planning & Evaluation division of BARC, Md. Shohid Uddin Bhuyan, System Analyst monitored the implementation progress of some SPGR sub-projects under NATP.

NUTRITION

Project Development/Project Financing

Contaminants and Adulterants in Food Chain and Their Mitigation

This project has been implementing since May 2011 under the co-ordination of Nutrition Unit, BARC and the project is being funded under the NATP, Phase 1. The objectives were to i) Collect and collate the information derived through the component sub-projects to understand the present scenario and activities; ii) Development of communication materials for wide awareness building of producers, traders and consumers; iii) Organize disseminating training workshop/seminar and capacity building on food safety and quality; and iv) Co-ordination and monitoring of the component project activities to facilitate smooth implementation.

Due to the health consciousness of the consumers, the demand of safe food has been increasing rapidly all over the world since 80's. For the last decade, in Bangladesh, increasing buying capacity and willingness of consumers to get safe food in one hand and on the other hand, high rate of population increase and increasing gap in demand and supply of food indulges the producers and traders to a greater extend to involved in food chain for various unethical practices which has been ultimately inviting risk against national food safety and health issues. The use of hazardous chemicals with higher dosages on fruits and vegetables has become a vulnerable issue in the country.

Application of formalin on the body surface of fish has become common practice to keep the fish stiff and fresh looking for a longer period. Use of DDT, Nogos, Sobicron and various other harmful agro pesticides for the preservation of dried fish is also a common practice in Bangladesh. All these agents are considered as carcinogenic and equally responsible for damaging of internal organs of human body.

In Bangladesh, livestock product marketing and slaughter house management does not have any regulatory framework that need to be developed to ensure production of good quality carcasses and safe hygienic meat. The most commonly used and marketed popular fast food items of animal origin in Bangladesh, in most of the cases, prepared under poor hygienic environment which is considered responsible for outbreaks of various diseases after ingestion. In Bangladesh most common practice of food adulteration is i. Mixing with non food ingredients ii. Substituting with under quality food substances or fabrication iii. Texturing to mask the poor quality or under processing iv. Adding decomposed foods to fresh foods v. Misleading level of food ingredients on the packet vi. Misrepresentation of food composition vii. Using health hazardous agent in foods as preservatives viii. Application of coloring and flavoring chemical adulterants in food items.

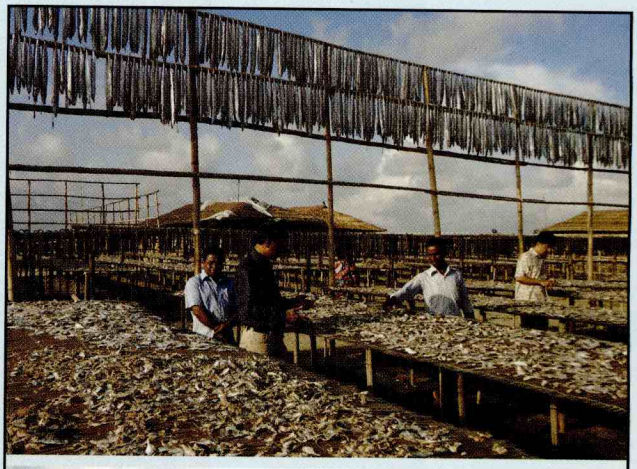
Sources of food contamination include environmental and industrial pollution, agricultural practices, food processing and packaging which is more common in a country like ours. Absorption of heavy metals through food has been shown to have serious consequences on health, economy and productivity of the national.

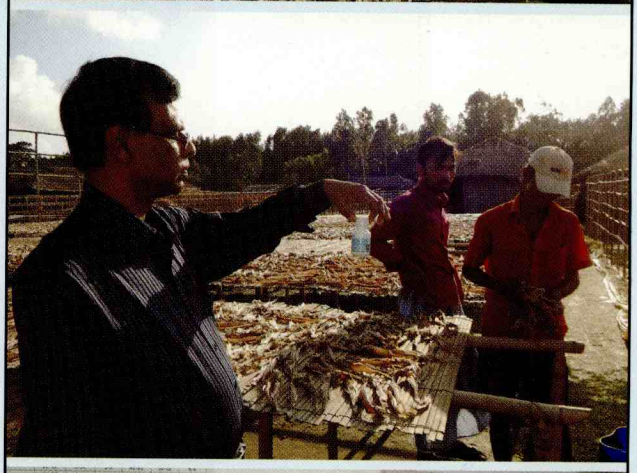
In case of processed foods, harmful chemicals, non-permitted preservatives, inorganic colors are randomly being used to make the foods tasty and self stable. Non-permitted food colors and other adulterants and various chemicals and hormones at a very high dose being used in all sorts of popular processed foods, fruits and vegetables in Bangladesh.

Keeping in mind, the Nutrition Unit of, BARC to ensure safe food for the nation by generating research based information for the policy makers, producers, traders, processors and consumers, has undertaken the present study covering five principal areas of food and food processing like rice grain, poultry and meat products, fish and fishery products, processed foods products and fruits and vegetables etc. The result so far achieved by the different component of the project are briefly given below:

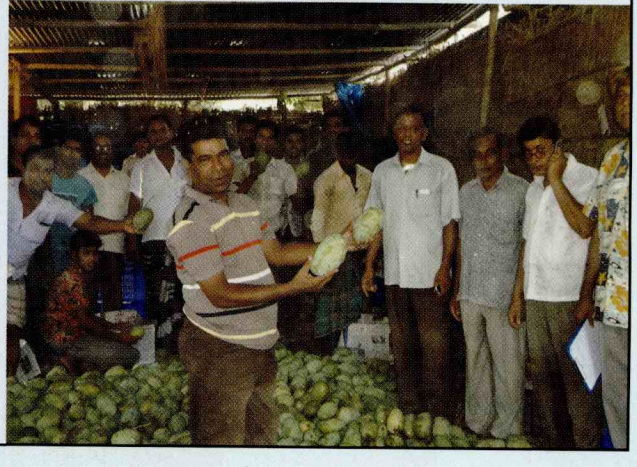
Coordination and Monitoring

The unit monitored the ongoing research progress of BLRI, BRRI, BARI and Chapainababgonj mango production and trade areas. The unit organized two research progress review workshops and one expert consultation meeting centrally at BARC, Dhaka. In addition, one special workshop on use of chemicals in fruit production with special emphasize to mango ripening was also organized at Volahat Upazila Auditorium, Chapainababgonj on 22 June 2013. During this period the central unit also organized four training programs for awareness creation and knowledge improvement of stakeholders on safe and hygienic production of dry fish, milk and meat at different locations of the country (Cox's Bazar, Chittagong and Sirajgonj etc). The coordination unit published two extension leaflets on mitigation of contamination of adulterated milk, meat and formalin adulteration in fish etc. Following the recommendation of the research progress review workshop of 2011-12, the unit also conducted a survey in the major markets of Dhaka city to identify adulteration practices and its status in different food items like vegetable, fruits, egg, milk, meat, fish and fish products and various processed foods and produced report. Financial progress, reporting and procurement activities of the unit performed as per plan of the year.





Pictorial view of some monitoring activities of the SPGR project



Survey on Food contamination and adulteration practices in the city markets

As per recommendation made in the annual progress review workshop (2011-12) in last May 2012 the Nutrition Unit of BARC, under its SPGR sub-project conducted a survey in different city markets during July-October 2012 to understand the level of practices of contamination and adulteration in different food items like vegetables, milk and meats, eggs, fish and fruits etc. Markets included for this survey were Rathkhola, Nawabpur; Mirpur - 1 & 2; Madhubug, Mogbazar; Tejkonipara; JatraBari; Mohammedpur; Tongi; Kawranbazar; Aminbazar, Savar; Badamtoli; Muslim Bazar etc. Study reveals an alarming status of adulteration practices particularly in milk, fish and fruits. In case of vegetables, 77% of the respondents were not found to practice any sorts of adulteration. As ripening agent ethephone applied in tomato by 7% of the traders and 16% of them apply various chemicals as coloring agent for leaf vegetables and other vegetables like bitter gourd, cucumber etc.

In case of fish, 85% of the traders were found to apply various adulterants as preservative or as coloring agent. Formalin application in various forms and process was common for 21% traders. Application of DDT, a hazardous chemical compound was also recorded in case of 1% dry fish producer.

Milk adulteration practicing was observed in case of 88% traders out of which 35% are practicing artificial milk preparation from a combined mixture of various low food grade substance/chemicals and selling this in the retail markets. Other practices are adulterated with water, formalin, testing salt (mono-sodium glutamate) flour etc. No practice of egg adulteration in the local market reported.

Multidimensional use of harmful adulterants and chemicals in fruit ripening and preservation was recorded as a major practice for commonly available fruits in the market. Use of calcium carbide for mango ripening (16%), use of ethephon for ripening of banana, pineapple and mango (10-18%) are widely practiced scenario. Application of hormone in pineapple, masterd oil in dates, paraffin wax in apple and formalin spray in fruits are also practicing at various levels.

BARI Component

A survey was conducted at four locations of Rajshahi districts namely Baneshor, Rajshahi Sadar, Puthia and Tanore upazilla to assess the present status of the usage of pesticides and ripening chemicals in papaya cultivation. Besides, from Ishardi, Pabna five farmers were included in this study. Ring spot and mosaic virus are two major diseases of papaya, whereas mealy bug is the major insect-pest found in the study areas. Among the selected farmer, none followed IPM approach. Generally, farmers of the study areas, were applied pesticides following prescribe dosages but higher frequencies (15-25 times) at 7-10 days interval. According to the grower's opinion, they harvested the fruits after 7-10 days of last spray. The highest yield (150 t ha^{-1}) of papaya was recorded in Ishardi, Pabna, which was much higher than Rajshahi district (110 t ha^{-1}). This higher yield at Ishardi was probably due to the use of high yielding variety as well as high management of the crop. All the papaya growers at Rajshahi and Ishwardi except 'Pepe Badsha' harvested their papaya at green stage and sold as vegetable purpose. Mr. Badsha, on the other hand, was harvested papaya at physiologically mature but colour breaking stage (developed 5-10 yellow colour), which was sold as dessert purpose.

Another study was undertaken to detect and quantify the left over ethephon residue in different collected samples (mango, banana, papaya, tomato) from farmers/traders/whole sale market of Rajshahi, Bogra, Tangail, Jessore, Gazipur and Dhaka. The study concludes that among three fruits and one vegetable, only 06 mango samples exceeds ethephon above MRL (2ppm) recommended by FAO. Detection and quantification results of the heavy showed that among 10 heavy metals (in 08 samples of papaya), only six heavy metals were detected residue. The levels of As, Pb, Ni, Fe, Cr, Al were 0.0504 ppm, 0.0568-1.12 ppm, 0.0596-0.1198 ppm, 1.9412-2.8656 ppm, 0.1186-0.2284 ppm, 0.0546-0.1983 ppm, respectively. In case of banana fruits only Pb, Ni, Fe, Cr and Al is present in two collected samples which is 0.12ppm, 0.05-0.269 ppm, 7.65-10.77 ppm, 0.06-11.150 ppm, 1.51 ppm, respectively. Similarly, Ni (0.01-1.039 ppm), Fe (0.477-5.455 ppm), Cr (0.033-1.269 ppm) and Ag (0.136-0.800 ppm) were detected in collected mango fruit samples. Laboratory experiment showed that ethephon can be applied @500ppm-750ppm at matured stage of mango and papaya and @750ppm-1000ppm for breaker-turning tomato for uniform ripening within 5-6 days at ambient temperature (23±2°C). Residual level of the applied ethephon was detected as 0.11ppm-0.88ppm at edible stage, which was lower than MRL (2ppm).

BFRI (Fisheries)

Study for determining the bioaccumulation of heavy metals in fish and shrimp muscles sampled from the River Karnafuli, Chittagong on Goby (*Apocryptes bato*) and shrimp of Karnafuli (*Palaemon karnafuliensis*) for the detection of six heavy metal

concentrations like, copper (Cu), chromium (Cr), lead (Pb), iron (Fe), aluminium (Al) and nickel (Ni) showed that out of six hazardous substances Cu, Cr, Pb and Ni were identified in low amount in fish and shrimp. These metals were within the safe limit in the fish and shrimp. But the bioaccumulation of Al and Fe were in high concentration in almost all samples. Among the water quality parameters, the DO concentration was found very low in winter. The average concentrations of Fe, Pb and Al in water samples were found in higher concentration in Karnaphuli River water. On the other hand, Cu, Fe and Pb were found in higher concentration in soil samples. Study indicated that water quality of Karnaphuli river is deteriorating and the aquatic organisms are getting contaminated due to discharge of untreated industrial wastes. Study on heavy metal contamination in water, soil and fish and shrimps from the Passur river in the Mongla port area, Khulna on *Liza parse* and shrimp (*Penaeus monodon*) showed that heavy metals like Cd, Cr, Cu, Fe and Pb within lower limit of permissible level for human health, the concentration of Zn exceeded the permissible limit.

Megazeo, Zeofresh, Zeotox, Gastrap, Gas tablet and Zeolite were found to be the most widely used components by 45% farmers for soil and water quality management. On the contrary, lime, common salt and timsen were the most widely used chemicals by 100%, 73% and 42% farmers respectively, as disinfectants and to control fish diseases. Some antibiotics like renamycin, oxydox-F and oxytetracycline were used during disease outbreak. A large number of chemicals used for growth promotion included vitamins, minerals, amino acids and growth promoters. Among those ACI mix super fish and Megavit Aqua were used by 47% and 37% farmers, respectively.

Bacteriological investigation of widely spread koi fish (*Anabas testudineus*) from farmers pond revealed significantly higher bacterial count (8.44±0.04 log CFU/ml) when compared to BFRI ponds sample (7.92±0.17) ($p \leq 0.05$). Similarly highest TVC was found in mud and water samples from, farmers' pond (6.87±0.73 and 7.41±0.04 log CFU/ml, respectively) as compared to BFRI ponds (5.04±0.07 and 5.40±0.09 log CFU/ml, respectively). Bacteria isolated as *Pseudomonas* spp. (21.40%), *Aeromonas* spp. (33.46%), *Vibrio* spp (14.78%), Salmonella spp. (21.40%) and *E. coli* (8.94%), indicated contamination of those some health hazards microorganisms. Presence of naturally occurring formaldehyde in freshwater and marine fishes were investigated. Biochemical tests and test by Formaldehyde Detecting Kit in aqueous media showed presence of naturally occurring formaldehyde in marine fish like, Bombay duck (*Herpodon nehereus*) @ 40-60 ppm which showed increasing trend after preservation in frozen condition. In contrast, freshly caught carp fish like ruhu, tilapia did not show presence of formaldehyde.

BLRI Component

An investigation was carried out with the objectives to identify the presence of adulterants in milk, meat and feed available in the market of selected locations. To determine the contaminants and adulterants in milk and meats available in the market under selected locations such as Savar, Dhaka, Gazipur, Pabna, Sirajgonj, Joypurhat, Rangpur and liquid milk samples marketed by different commercial companies in Bangladesh were collected and analyzed in the Lab. for identification of pond or river water, starch, formaldehyde, cane sugar, hydrogen per oxide. The bacterial load in the samples was determined through culture in nutrient agar & EMB agar using pour plate method. Eggs were collected from different markets of poultry producing areas such as Dhaka, Chittagong, Sirajgonj, Joypurhat, Munshigonj of Bangladesh. Residue of antimicrobial drugs such as sulfonamide, ciprofloxacin, oxytretracycline and Endrofloxacine were investigated in collected egg samples by using Enzyme Linked Immunosorbant Assay (ELISA).Pesticide residue in fodder such as DDT, Aldrin, Heptachlor, Endrin & Dieldrin were determined by GC with ECD from BARI Entomology lab. The presence of leather meal in commercial compound cattle & poultry feeds; the feed samples were determined by the ammonium molybdate method.

BRRI Component

Two hundred three rice and rice based food product (Popped rice, puffed rice and flattened rice) samples were collected for heavy metal estimation from three types of locations like- i. Farmer's fields (industrial and non-industrial), ii. Market retailers and iii. Overseas origin (imported) from Gov't silos. Out of eighty six samples of industrial fields eight samples were found to be highly contaminated having values greater than the risk level of daily intake of Cd (>0.07 mg/416.01 gm). Cadmium content in the non industrial rice samples ranged from 0.000mg/416.01 gm to 0.125mg/416.01 gm. Among seventy six samples collected from four market locations, twenty one samples were found having greater amount than the risk level of daily intake of Cd. No samples collected from Govt. silos were found to have greater than the risk level of daily intake of Cd. All the 203 samples estimated for Chromium content had

Chromium level lower than the risk level of daily intake (>0.35 mg/416.01 gm). Only one sample from industrial field in Narayanganj district had shown to have a very high amount of Pb in it. No other sample from any of three sources had a higher amount of lead than the risk level of daily intake of Pb (>0.25mg/416.01 gm).

One hundred and sixty four rice samples were investigated for fungi association, which were collected from different CSD and LSD food storages of south-western Khulna and Satkhira districts. Fungi were identified as *Aspergillus, Penicillium, Fusarium, Rhizopus, Curvularia, Tricochonis and Alternaria* sp. Generally infection was low. Average incidence of *Aspergillus* (1.87%) was higher followed by *Penicillium* (1.60%), *Rhizopus* (1.26%) and *Fusarium* (0.79%) irrespective of the storage. Fungal infection ranged 0.57-2.43% in CSDs and 0.66-2.53% in LSDs. All four stored grain fungi were more prevalent in Bangladesh rice than Thailand, India and Pakistan rice in Maheshwarpasha CSD. Similar results were also found in Khulna CSD both for *Penicillium* and *Rhyzopus*. But *Aspergillus* and *Fusarium* were found more in Indian rice.

Among 41 out of estimated 46 rice samples, none of them contained aflatoxin B1 above the UNICF/WHO/FAO maximum permissible level 30 µg/kg (ppb) in foods for human consumption. Only 5 samples contained aflatoxin B1 ranged from 5.39-8.08 and 3 samples contained 0.06-0.13 µg/kg aflatoxin B2. Incidence of carbofuran 10G was detected in the harvested rough rice among the tested 6 insecticides. Due to lack of protocol fungicides were not tested.

BAU Component

The food items selected for analyses to assess adulteration during reporting period are spices powder (turmeric, chili, zinger, coriander and mixed spices) and miscellaneous products (Mustard oil, coconut oil, chanachur and noodles). Five types of turmeric powder (Radhuni, ARKO, BD, Fresh and Open market samples), five types of Chili powder (Radhuni, ARKO, BD, Fresh and Local Non-brand product), five types of Coriander powder (Radhuni, ARKO, BD, Fresh and Local Non-brand product), Two types of Cumin powder (Radhuni and ARKO), and three types of mixed powder (Radhuni, ARKO and BD), Five samples of Mustard oil (Rupchada, Prodip, Radhuni, Teer and Universal tasty) four samples of coconut oil (Parashot, Jui, Cute and Hansh Marka), and five samples of soybean oil (Rupchanda, Teer, Fresh, Muskan and Lose Pack), Five samples of Chanachur (BD, PRAN, Ruchi, Bombay Sweets and Local made) and four samples of noodles of popular brands (Cocola, Deco, AP, Sajib) were collected from local market and analyzed. In spices powders, moisture, total ash, non-volatile ether extracts and total bacterial count were found higher than that of Reference Value (RV). The tested oils were found to contain very high moisture, insoluble impurities, acid value, low saponification and iodine value, and low uric acid (Mustard oil) indicating adulteration and low shelf-life. However the soybean oils fulfilled all the parameters of RV of BSTI. Moisture, total ash and acid value of all the Chanachur samples were found higher than that of RV indicating adulteration and susceptibility to rancidity.

Project Implementation

Dr. Md. Monirul Islam, Director (Nutrition) worked as the co-coordinator of the co-ordinated SPGR sub-project entitled "Contamination and adulterants in Food Chain and Their Mitigation".

Research Management and Coordination

As a part of the yearly activities, Nutrition Unit was involved in the review, monitoring and participatory program development of the nutritional activities of the DAE, DAM, BIRTAN, BNNC, and ICDDR'B. As Director (Nutrition) took part in BARC's centrally monitoring of the supplementary research funding program and action plan for pulses, oilseeds and spices implementation programme during the reporting year.

Policy Level Contribution

Expert Committee: The Nutrition Unit contributed much in several programs on nutritional advocacy, motivation of rural households and project design by the Bangladesh Agricultural Research Institute (BARI), Bangladesh National Nutrition Council (BNNC), Institute of Food Science and Technology (IFST) of BCSIR, ICDDR'B and few NGOs working at the grassroots level.

Director (Nutrition) was involved as the member of the Divisional Committee on i. Fish and Fisheries Products (AFDC - 23) and ii. Irradiated Food Products Division of Bangladesh Standards and Testing Institution (BSTI) and contributed to provide quality products and developing standards of these different products. He also contributed to produce the Dietary Guidelines of Bangladesh, published by FAO and BIRDEM .

National Level Collaboration and Linkages

Nutrition Unit continued to be closely involved in the process of programme development, review mechanism of various food and nutrition related activities of NARS, relevant institutes and universities. Besides, the unit is also involved in planning and organization of activities undertaken by the institutions, like, DAE, BNNC, IFST, ICDDR'B WFP, INFS, etc., working in the field of food and nutrition, food safety, primary health care, food habit and cooking practices.

Printing of extension materials

During the reporting period, the coordination unit published two extension materials on adulteration mitigation measures of milk/meat and formalin in fish. In addition to that the unit printed out one annual progress report (2012-13), one survey report of city markets and one scientific paper was published under joint authorship on fisheries component in the journal of fisheries research.

II. HUMAN RESOURCES DEVELOPMENT

Crops

Training on Rice and Wheat Cultivation in Unfavourable Ecosystem: A two-day long training programme on rice and wheat cultivation in unfavourable ecosystem was organized under AFACI Food Security Project by Crops Division, BARC during 8-9 May 2013. The main objective of the training programme was to improve knowledge and skills of the scientist/officials working on rice and wheat cultivation for unfavourable ecosystem. A total of 30 participants from BARC, BRRI, BARI, DAE and BADC attended the training programme. In this two-day training programme, 10 lectures were delivered covering varietal development, pest management, improved cropping system with management packages, developed farm machinery, quality seed production of rice and wheat. Expert scientists/officials from BARI, BRRI and BADC in relevant fields were invited as resource speaker. Dr. Wais Kabir, Executive Chairman, BARC distributed certificates as Chief Guest.

Training on Seed Quality Management: A 3-day long training programme on Seed Quality Management was organized by Crops Division, BARC, during 28-29 January 2013 at BARC, Dhaka. The objectives of the training programme were to upgrade knowledge and skill of scientists and officers involved in seed research, development and marketing sector. A total of fifteen resource persons from BARC, BARI, BADC, BSMRAU, SCA, MOA, DAE and ACI Seed Ltd. delivered lectures on the training course. Important aspects of seed quality management, agronomic consideration, seed (including hybrid seed) production and multiplication techniques of seed health and pest management, seed processing and storage techniques, seed certification system, seed business and marketing, seed policy-ordinance-rules of major crops were included in the lecture schedule. Forty participants from DAE, BADC, BARI, BRRI, SCA, BINA, BSRI, BJRI, CDB, ACI Seed Ltd., Bavilon Seed, Metal Seeds, Gaint Agro Ltd. Lal Teer Seed Ltd., BRAC and BARC attended the training course.

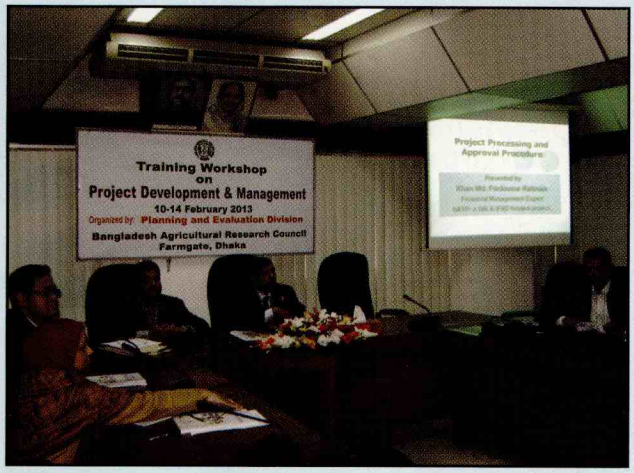
Training on Knowledge and Awareness Building on Agricultural Policies of Bangladesh: A 2-day long training programme was organized by Crops Division, Bangladesh Agricultural Research Council (BARC), during 29-30 April 2013 at BARC, Dhaka. A total of 12 selected policies were included in the training schedule and the renowned persons of the subject were nominated as resources speaker. Forty senior level participants from DAE, BADC, BARI, BRRI, SCA, BINA, BSRI, CDB, SRDI and BARC were attended the training course.

Training on Good Agricultural Practices (GAP): A day long training programme on Training on Good Agricultural Practices (GAP) in Fruits and Vegetables Production was organized under AFACI GAP project by Crops Division, Bangladesh Agricultural Research Council (BARC), during 27 April 2013 at BARC, Dhaka. The objective of the training programme was to improve knowledge and skills of the scientist/officials GAP principles. A total of 30 senior level participants from BARC, BARI, BINA, BCSIR, DAE, BADC and private sector attended the training programme. Five lectures were delivered covering principles and codes of GAP. Dr. Wais Kabir, Executive Chairman, BARC distributed certificates as chief guest.

Planning and Evaluation

Training on Project Development and Management: A five day-long training workshop on "Project Development and Management" was organized by the Planning and Evaluation Division, Bangladesh Agricultural Research Council, during 10-14 February 2013. Dr. Wais Kabir, Executive Chairman, BARC was present in the inaugural session as chief guest. Dr. Paresh Chandra Golder, Member-Director (Planning & Evaluation) presided over the inaugural ceremony. Senior Officers from different divisions of Bangladesh Agricultural Research Council were also present in the inauguration ceremony. Dr. Abdul Awal, Principal Scientific Officer (Planning & Evaluation) BARC and the course coordinator of the workshop delivered welcome address. Twenty five participants from the different NARS institutes including BARC attended the workshop. Resource persons were drawn from BARC, National Academy for Planning and Development, and Bangladesh Agricultural University. The course content of the training

workshop included the topics on project cycle, project appraisal, logical framework, preparation of different types of project documents (DPP/RDPP/TPP), critical path method, result based monitoring, PPR-2008, financial delegations etc. The workshop was conducted based on class lectures,



A training workshop of Project Development and Management

practical sessions and open discussions. The chief guest in his speech mentioned that this training workshop was organized to make the participants conversant with project planning and management. The chairperson of the training workshop in his speech hoped that this training would be helpful for the participants to prepare and manage different kinds of projects properly and efficiently. The workshop ended on 12 April, 2013 through a certificate giving ceremony where the Executive Chairman, BARC was present as chief guest.

TTMU

Training workshop for mango producers of Dinajpur district on orchard management and post harvest technology of mango: Technology Transfer Monitoring Unit, BARC organized a training Programme During 20-21October 2012 at Dinajpur training. The objective of the training Programme was to upgrade the knowledge, skill of mango growers regarding communication status, yield gap factors and technological gap between researches and farmer's practices. Senior Scientists from Regional Fruit (mango) Research Station, Chapainoabgang delivered lectures on introduction of modern mango varieties, establishment of mango orchard, inter-cultural practices, fertilizers & irrigation management, pest management, post harvest technology and marketing as resource persons. Thirty farmer as participants from Satkhira Sadar, Tala & Kolaroa Upazilla were attended. Dr. Abul Kashem, Director, TTMU, BARC mentioned that proper management practice of mango orchard alone could achieve the production double in this region. Deputy Director, DAE, Satkhira district Mr. Haribullah Sarker presided over the inaugural session. Farmers opined that more training programs should be organized, mango saplings are not mostly from local variety, and learning of fertilizer & irrigation management and plant protection measures can able to minimize the farmers' knowledge gap.

Upazilla Agricultural Officers Training at BSRI, Ishurdi: A three-day long training programme was organized by Technology Transfer Monitoring Unit, BARC from 10-12 January, 2013 at BSRI, Ishurdi. The objective of the training Programme was to update the Upazilla Agriculture Officers' knowledge and skill on latest technologies which were generated by the agricultural scientists of BSRI and transfer these to the farmers' field. Scientists of BSRI, Ishurdi acted as resource persons on the training course. Technologies namely i) Introduction to modern varieties of sugarcane developed by BSRI, their characteristics, ii) suitability of the varieties in different parts of Bangladesh, iii) detail agronomy & production technique and development of biotechnological research of sugarcane, iv) variety development technology, v) insect, pest and disease control technology, and vi) delection of production technology, intercropping with sugarcane, seedling raise and transplanting of sugarcane were included in the training programme. Participants from 30 Upazillas attended the training Programme. Director General, BSRI, Ishurdi Md. Khairul Basar was the Chairperson, Dr. Abul Kashem, Director was Chief Guest, and Course Coordinator was Dr. Fauzia Yasmin, PSO, TTMU. Director General opined that the programme would be a very effective tool for quick dissemination of the recent technologies generated by BSRI, Ishurdi.

Upazilla Agricultural Officers Training at BSRTI, Rajshahi: A three-day long (26-28 January, 2013) training for Upazilla Agricultural Officers was organized by Technology Transfer Monitoring Unit, BARC at Bangladesh Sericulture Research and Training Institute (BSRTI), Rajshahi.The objective of the training Programme was to update the knowledge and skill of Upazilla Agricultural Officers on latest Technology generated by BSRTI, Rajshahi. Twenty Participants attended the training Programme.

Scientists of BSRTI acted as resource persons on the training course. Garden management technique for silk worm, Rearing of worm, and Raw silk production technologies were included in the schedule. Director General, BSRTI Dr. Md Jamal Uddin was the Chair Person, Dr. Abul Kashem, Director, TTMU was Chief Guest and Course Coordinator was Dr. Fauzia Yasmin, PSO, TTMU. In the closing session participants mentioned that similar training programme should be arranged frequently so that extension personals can interact with scientists to have solutions of their problems and put opinion regarding field of research for the future as well.

Upazilla Agricultural Officers Training at RARS, BARI, Jessore: From 9 to 11, February 2013 at RARS, Jessore, Bangladesh Agriculture Research Institute, a three-day long training for Upazilla Agricultural Officers was organized by Technology Transfer Monitoring Unit, BARC. The objective of the training Programme was to update the Upazilla Agriculture Officers' knowledge and skill on Coconut Mite technologies which were generated by the Agriculture scientists of BARI and transfer these to the farmers' field. Scientists of BARI, Gazipur acted as resource persons on the training course. Scientists of BARI acted as resource persons on the training course. Technologies namely Coconut production technology, Management practices at field level, Assessment of damage index of Eriophyid mite of coconut, Integrated management of Eriophyid mite of coconut, Biological control of Eriophyid mite of coconut, and Major insect pests and diseases of coconut and their management were included in the training schedule. Participants from 30 Upazillas attended the training Programme. Dr. Firoz Ahmed, CSO, RARS, Jessore, was the Chair Person where Dr. Abul Kashem, Director, TTMU was Chief guest, and Course Coordinator was Dr. Fauzia Yasmin, PSO, TTMU.

Upazilla Livestock Officers Training at BLRI, Savar: According to the Annual Work Plan 2012-2013, Technology Transfer Monitoring Unit, BARC organized a training program (26-28 February, 2013) for Upazilla Livestock Officers at BLRI, Savar, Dhaka. The objective of the training Programme was to update the Upazilla Livestock Officers' knowledge and skill on latest technologies generated by the scientists of BLRI and transfer these to the farmers' field. Scientists of BLRI, Savar, Dhaka acted as resource persons on the training course. Technologies namely PPR vaccines and disease prevention, Corn straw pellet feed, High yielding fodder production BLRI Napier 4, Development of Mina Mix, Community based Shuvra (*ïåv)* chick production and management of laying stage, and BLRI developed DNA kit were included in the training schedule. Twenty six participants from 30 upazillas attended the training Programme. This type of training will open new pathway of linkage between DLS & BLRI. Upazilla Livestock Officers also mentioned that such kind of training would make strong bond between Extension and Research organizations which eventually built up an intensive communication system so that problem in field can be solved immediately. In the inaugural session, Director General BLRI, Dr. Khan Shahidul Hauque was in the chair where Dr. Abul Kashem, Director, TTMU acted as a chief guest. In the closing session Additional Director, BLRI was in the chair. Course Coordinator was Dr. Fauzia Yasmin, PSO (TTMU).

Upazilla Agricultural Officers Training at BJRI, Dhaka: According to the Annual Work Plan 2012-2013, Technology Transfer Monitoring Unit, BARC organized a training program on 13-15 May 2013 for Upazilla Agricultural Officers at BJRI, Dhaka. The objective of the training Programme was to update the Upazilla Agriculture Officers' knowledge and skill on latest technologies generated by the scientists of BJRI and transfer these to the farmers' field. Scientists of BJRI, Dhaka acted as resource persons on the training course. Technologies namely Production technology for improve seed and fiber of jute, Management technology for soil and fertilizer, Protection technology for pest and insects, Protection technology for diseases, and Improved rotten technology for jute were included in the training schedule. Twenty six participants from 26 upazillas attended the training Programme. In the inaugural session Director General BJRI, Dr. Kamal Ahmed was in the chair where Dr. Wais Kabir, Executive Chairman, BARC acted as a chief guest, Dr. Abul Kashem, Director TTMU acted as a special guest and Dr. Fauzia Yasmin, PSO, TTMU was the Course Coordinator.

Upazilla Agricultural Officers Training at BRRI, Dhaka: According to the Annual Work Plan 2012-2013, Technology Transfer Monitoring Unit, BARC organized a training program (21-23 May 2013) for Upazilla Agricultural Officers at BARI, Gazipur. The objective of the training Programme was to update the Upazilla Agricultural Officers' knowledge and skill on latest technologies generated by the scientists of BRRI and transfer these to the farmers' field. Scientists of BRRI, Gazipur acted as resource persons on the training course. Technologies namely BRRI developed farm machineries for economic rice production, Crop management at different growth

stages of rice to increase yield, Method of quality rice production, Double transplanting of rice and some improved cropping patterns, Efficient fertilizer management for rice cultivation, Efficient and economic water management for rice cultivation, Methods of hybrid rice seed production at field level, and Disseminate technology: Bangladesh Rice Knowledge Bank (BRKB)-a tool at door step were included in the training schedule. Thirty Upazilla Agricultural Officer Participants from 30 upazillas attended the training Programme. In the inaugural session Director General BRRI, Dr. Sayedul Islam was in the chair where Dr. Abul Kashem, Director TTMU acted as a chief guest. In the closing session, Director General BRRI, Dr. Sayedul Islam was in the chair. Course Coordinator was Dr. Fauzia Yasmin, PSO (TTMU).

Upazilla Fisheries Officers Training at BFRI, Mymensingh: According to the Annual Work Plan 2012-2013, Technology Transfer Monitoring Unit, BARC organized a training program (22-24 June, 2013) for Upazilla Fisheries Officers at BFRI, Mymensingh. The objective of the training Programme was to update the Upazilla Fisheries Officers' knowledge and skill on latest technologies generated by the scientists of BFRI and transfer these to the fishermen's field. Scientists of BFRI, Mymensingh acted as resource persons on the training course. Technologies namely Early brood production technology of Prawn, Production technology for Pabda, Gulsha, Production technology for Pangus at pond, Breeding and production technology of Tengura, Improve feed production technology for fish, Fish and fingerlings preservation and quality control, and Fish heath and prevention from disease were included in the training schedule. Thirty participants from 30 upazillas attended the training Programme. In the inaugural session Director General BFRI, Dr. Suvas Chandra was in the chair where Dr. Abul Kashem, Director TTMU acted as a chief guest. In the closing session Dr. Suvas Chandra Director, BFRI was in the chair. Course Coordinator was Dr. Fauzia Yasmin, PSO, TTMU.

Upazilla Agricultural Officers Training at BINA, Mymensingh: According to the Annual Work Plan 2012-2013, Technology Transfer Monitoring Unit, BARC organized a training program (26-28 June, 2013) for Upazilla Agricultural Officers at BINA, Mymensingh. The objective of the training Programme was to update the Upazilla Livestock Officers' knowledge and skill on latest technologies generated by the scientists of BINA and transfer these to the farmers' field.Technologies namely Jibanu shar production technology, Crop production using low irrigation application, Soil and fertilizer management for BINA dhan, dal and oil, Diseage, pest and insects management for BINA dhan, dal and oil were included in the training schedule. Thirty participants from 30 upazillas attended the training Programme. In the inaugural session, Dr. A. Razzaque, Director (A&S) BINA, was in the chair. In the closing session, Director (A&S) BINA, was in the chair where Dr. Abul Kashem, Director TTMU acted as chief guest. Course Coordinator was Dr. Fauzia Yasmin, PSO, TTMU.

Livestock

Disease surveillance and diagnosis of farm animal diseases using molecular techniques: A training on Disease surveillance and diagnosis of farm animal diseases using molecular techniques was held in two batches, from February 26 to 28, 2013 (1st batch) and from March 30 to April 1, 2013 (2nd batch) at PRTC, CVASU, Chittagong with the combined effort of BARC livestock division and PRTC. There were 20 trainees (ULO and VS) from Department of Livestock Services (DLS). The training was funded by the coordinated SPGR project (BARC part) of livestock division of BARC, "A Coordinated project on the Surveillance of Important Infectious, Zoonotic and Emerging Diseases of Livestock and Poultry in Bangladesh".

Progress Review Workshop on SPGR Livestock Sub-projects

A day-long workshop on Progress Review Workshop on SPGR Livestock Sub-projects was held on January 29, 2013 at BARC Conference Room No. 1 and organized by Livestock Division of BARC. A total of fifty two participants from BARC, BLRI, BAU, DLS, NATP-PCU and BRRI (one biotechnology expert) attended the workshop. A total of eleven papers were presented in the workshop. A proceeding of the workshop has already been published. The workshop was funded by PIU-BARC, NATP Phase-1, BARC.

Fisheries

Three training programs were approved for BFRI. However, only riverine station, Chandpur organized two trainings.

- A ToT for the SPGR project staffs was organized by BFRI in Mymensingh.
- All the scheduled training programs under SPGR projects were conducted.

The courses are implemented with the coordination of BFRI through its different stations.

Forestry, NRM

National Seminar on Fruit Tree Plantation Programme 2013: Organized a national seminar on fruit tree plantation programme on 16 June, 2013 at BARC auditorium, Farmgate, Dhaka. Honorable Minister Motia Chowdhury, MP. Ministry of Agriculture was present as Chief Guest and Dr. S. M. Nazmul Islam, Secretary, Ministry of Agriculture presided over the seminar. Mr. M. Anamul Haque, Former Director General, DAE, Farmgate, Dhaka was the keynote speaker. The programme was undertaken as a part of national plantation programme.

Training Programme on Forestry Technologies for Capacity Building of Professionals

A two days training programme on "Forestry Technologies for Capacity Building of Professionals" was organized during 18-19 February 2013 at BARC conference room-1. The objectives of the training programme were to disseminate the forestry technologies to the end users and to popularize the forestry technologies with in the stakeholders. 60 participants of 30 organizations participated in the training programme. Dr. Wais Kabir, Executive Chairman, BARC was Chief Guest in the inaugural session. Dr. Ahmad Ali Hassan, Member-Director (NRM), BARC, presided over the session as Chairperson.

Programme on Agroforestry Practices in Bangladesh

A two-days training programme on "Agroforestry Practices in Bangladesh" was organized during 11-12 March 2013 at BARC. The objectives of the training programme were to develop the concept and acquainted with the tools of agroforestry. 40 participants of 30 organizations participated in the training programme. Dr. Wais Kabir, Executive Chairman, BARC was Chief Guest in the inaugural session. Dr. Ahmad Ali Hassan, Member-Director (NRM), BARC, presided over the session as Chairperson.

Training on Agroforestry Technologies Developed through SPGR Project

Another two days training programme on "Agroforestry Technologies Developed through SPGR Project" was organized during 19-20 March 2013 at BARC conference room-1. The objective of the training programme was to disseminate the achievements of agroforestry new technologies developed through SPGR project. Dr. Wais Kabir, Executive Chairman, BARC was Chief Guest in the inaugural session. Dr. Ahmad Ali Hassan, Member-Director (NRM), BARC, presided over the session as Chairperson.

Research Review and Programme Planning workshop

Organized a Research Review and programme planning workshop on Agroforestry system in Bangladesh at BARC on 25-26 February 2013. The objectives of the workshop were to review the research activities of forestry and agroforestry in Bangladesh, identify the problems, prospects, research activities and development of forestry and agroforestry in Bangladesh, Future research planning for forestry and agroforestry in Bangladesh and make coordination among the stakeholders and to avoid the duplication of the programme. Dr. Wais Kabir, Executive Chairman, BARC, was Chief Guest in the inaugural session. Dr. Ahmad Ali Hassan, Member-Director (NRM), BARC, presided over the session. All the six partner organizations of the SPGR sub-project presented the progress of their respective activities in 2012 and the planned activities in 2013 and different organizations were presented, discussed and developed in the workshop.

Organized a workshop on the Progress of SPGR Sub Project "Improvement of Agroforestry Practices for Better Livelihood and Environment" and "Enrichment and conservation of mangrove ecosystem" for 2012-13 of BFRI, Khulna:

Organized an annual workshop on the Progress of SPGR Sub Project "Improvement of Agroforestry Practices for Better Livelihood and Environment" on 24 June 2013 at BARC. Dr. Wais Kabir, Executive Chairman, BARC was Chief Guest in the inaugural session. Dr. Ahmad Ali Hassan, Member-Director (NRM), BARC, presided over the session. 75 participants of 30 organizations were present in the workshop. Proceeding of the workshop with valuable recommendations is being published. The objectives of the workshop were to review the research activities of SPGR agroforestry sub projects and enrichment and conservation of mangrove ecosystem for 2012-13, to identify the problems, prospects, research activities and development of NATP-SPGR agroforestry and Future research planning for agroforestry and enrichment and conservation of mangrove ecosystem in Bangladesh through these projects.

Agricultural Engineering, NRM

Research Planning Workshop on Agricultural Engineering

Two days NARS Research Planning Workshop on Agricultural Engineering was held on 11-12 June 2013 at BARC, Dhaka Bangladesh. Agricultural Engineer's and experts from NARS was attended in the workshop. Workshop evaluated of Agricultural Engineering Research Reports (2012-13) and Planning Future Research Program (2013-14) of NARS Institutes. The workshop was organized by the Agricultural Engineering Section, Natural Resource Management (NRM) Division, BARC. The objectives of the workshop were to review the status and needs of agricultural engineering research in Farm Machinery, Irrigation & Water Management and Postharvest Technology. Ninety nine Agricultural Engineers from NARS Institutes, universities and other organization participated in the workshops. Participants offered valuable suggestions and recommendations in various issues on i) Farm Machinery, ii) Irrigation and Water Management iii) Postharvest Technology.

View of Research Planning on Agricultural Engineering workshop

One day Workshop on findings of Coordinated Sub–Project on 'Water Management for Enhancing Crop Production under Changing Climate' was held on 23 June 2013 at BARC, Dhaka Bangladesh (Fig. 3). About seventy five Agricultural Engineer's and experts from NARS Institutes, universities and other organization was attended in the workshop. Participants offered valuable suggestions and recommendations on project activities.

Agricultural Engineering Section, BARC and Farm Machinery and Postharvest Process Engineering Division, BARI. had jointly organized 2 (two) batches of training course on "Agricultural Engineering Technology (Use of Farm Machinery and Efficient Irrigation System Management)" at BARI, Gazipur. The objective of this training was to awareness development about the technologies available in NARS institutes to Agricultural Engineers, working DAE and NARS institutes. More than 30 Agricultural Engineers from DAE are participated in two batches of the training. First batch of the training was held 25th May to 29th May 2013, Inaugural session was chaired by Engr. Shoeb Hassan, CSO (FMP. Engg.), BARI. Dr. Sultan Ahmmed, CSO (Agril. Engg.), BARC was present as Chief Guest. Dr. Pijush Kumar Sarkar, CSO (IWM.), BARI was present as special guest.

Second batch of the training was held 05-08 June, 2013, at BARI, Gazipur. Inaugural session was chaired by Engr. Shoeb Hassan, CSO (FMP. Engg.), BARI. Mr. Md. Mokhlesur Rahman, Director (T & C), BARI was present as Chief Guest. Dr. Sultan Ahmmed, CSO (Agril. Engg.), BARC was present as special guest and as well as the training coordinator for all the batches.

Soils, NRM

Scientists of Soils Unit participated in different training, workshop and study tour programs home and abroad organized by different organizations. The scientists of the Unit took part in sharing knowledge among the participants of these programs and provided with comments, suggestions etc. especially in the workshops and seminars. The scientists also took part in a number of discussion meetings with the foreign delegates visiting BARC. The scientists of Soils Unit Imparted the following training and study tour programs home and abroad during 2012-13:

Training

1. Training on *Research Proposal Preparation and Scientific Report Writing* held at BRAC-CDM at Rajendrapur, Gazipur during 09-13 February 2013.
2. Training on *Good Agricultural Practices (GAP) in Fruits and Vegetables Production* held at BARC, Farmgate, Dhaka during 27 April 2013.
3. Training on *Rice and Wheat Cultivation for Unfavorable Ecosystem* held at BARC, Farmgate, Dhaka during 21-22 May 2013.
4. Training on *Research Proposal and Scientific Report Writing* held at BRAC-CDM, at Rajendrapur, Gazipur during 11-16 May 2013.
5. Training on *Application Software for Office Management* at BARC, Farmgate, Dhaka during 26-30 May 2013.
6. Training on *Modeling Climate Change Impact on Bangladesh Agriculture* held at BRAC-CDM at Rajendrapur, Gazipur during 27 July to 03 August 2013.

Annual Review of Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns Workshop

Annual Review of Coordinated Project on Soil Fertility and Fertilizer Management for Crops and Cropping Patterns Workshop was held at Bangladesh Agricultural Research Council, on 26 June 2013. This is a coordinated sub-project comprising of eight research components (OFRD, BARI and SSD of BARI, BRRI, BINA, BSRI, BJRI & BAU; and SRDI) along with BARC as a coordinating agency. Project activities include soil testing and field trials on fertilizer requirements for a range of crops (field crops, vegetables, fodder & inter crops) and major cropping patterns covering about twenty AEZs of Bangladesh mainly in floodplains and terraces. In this workshop, all PIs of respective components presented their research activities. The aims of the workshop were to evaluate the progress of the project activities of each component with the view to formulate and update fertilizer recommendation for crops and cropping patterns in order to improve and sustain productivity. One research component (BAU) is specifically involved in evaluating micronutrient requirement for different crops under six (6) different AEZs.

Workshop on NPK briquette

A day-long national workshop on NPK briquette was held at Bangladesh Agricultural Research Council (BARC) on March 28, 2013. The workshop was organized jointly by BARC and IFDC (International Fertilizer Development Center). Begum Matia Chowdhury, MP and Honorable Minister of Agriculture, Government of the People's Republic of Bangladesh attended the inaugural session of the workshop as the Chief Guest. Mr. Monzur Hossain, Secretary, Ministry of Agriculture attended the session as the Special Guest. Mr. Aniruddho Roy, USAID attended as the Special Guest representing USAID Mission Director. The inaugural session was presided over by Dr. Wais Kabir, Executive Chairman, BARC. The workshop was conducted in three sessions; the Inaugural Session, the Technical Session and the Recommendation Session.

A total number of 157 participants from different NARS (National Agricultural Research System) institutes, Department of Agricultural Extension (DAE), Bangladesh Agricultural Development Corporation (BADC), Soil Resources Development Institute (SRDI), Agricultural Universities, Fertilizer Technical Sub-Committee Members and IFDC officials attended the inaugural session workshop. Sixty eight participants from among the organizations attended the Technical and Recommendation Sessions.

In the Technical Session three papers entitled (i) Response of rice to application of NPK briquette, (ii) Response of vegetables to application of NPK briquette and (iii) Chemical aspects of NPK briquette– manufacture, handling and storage were presented. The first paper was presented by Dr. Abdul Latif Shah, Chief Scientific Officer and Head Soil Science Division, BRRI, the second paper was presented by Dr. Apurba Kanti Choudhury, Principal Scientific Officer, On-Farm Research Division, Bangladesh Agricultural Research Institute (BARI) and the third paper was presented by Mr. Jose Ramon Lazo de la Vega, Senior Engineer/Program Leader, Fertilizer Technology Program, Research and Development Division, IFDC. The paper presentations were followed by open discussion. For proper documentation/recording the participants were encouraged to provide comments, suggestions and questions in writing in a prescribed format and the speakers responded to their respective questions. Besides, all the comments and suggestions were taken into consideration in formulation of the recommendation.

National workshop on NPK Briquette

The Technical Session was followed by Group Discussion to formulate a draft recommendation. The participants of the workshop were divided into three groups, (i) Wetland Group, (ii) Upland Group and (iii) Chemical aspects of NPK briquette Group. Professors of different universities worked as the Group Leaders in all three groups. The Groups worked for about one hour to formulate draft recommendations. The draft recommendations were presented in the house by the respective Group Leaders and were discussed thoroughly before finalizing of the recommendations.

AERS

Review of Socio-economic Research Programmes of NARS Institutes

A day long workshop on *Review of Socio-economic Research Programme (2012-2013) and Future Research Programme (2013-2014) of NARS Institutes* organized by the Agricultural Economics and Rural Sociology (AERS) Division, held on 28 June 2013 at Conference Room #1, Bangladesh Agricultural Research Council (BARC). A total 80 participants from NARS institutes, Universities, BADC, DAM and private sector attended the workshop. A total of 35 papers and 30 brief future research programmes were presented. In the technical session of the workshop, reports on previous year implemented programmes and future programme for the next year were presented. Agricultural Economics Division of BARI presented 12 Research report and 6 brief future research programmes, from HRC, BARI 2 Research report and 2 brief future research programmes were presented, from BRRI 14 Research report and 12 brief future research programmes were presented, from BSRI 2 Research report and 3 brief future research programmes were presented, from BFRI 3 Research report and 3 brief future research programmes were presented, and from BINA 2 Research report and 4 brief future research programmes were presented. Several recommendations were drawn on the basis of the valuable suggestion made by the scientists and expert members from different institutions. The major recommendations of the workshop are given below:

Bangladesh Agricultural Research Institute

1. Investigate the reasons of dis-adoption of BARI varieties and reason of adoption of other varieties. Identification of variety potentiality and the factors that enhance the potentiality are necessary. 2. Include IPM and information of farmer's IMP technology knowledge in the study. Magnitude of fertilizer and pesticides utilization by IPM farmers should be examined. The name of insecticides and pesticides should be mentioned in the study. Consider the large brinjal growing area like Jessore for the study location.

3. The research should be given the priority to develop new crop varieties with diseases resistance gene which will reduce the application of pesticides/insecticides in future.

4. Informationon how much of the land have been shifted to ber cultivation, how many farmers have been shifted, why they are shifted to ber cultivation. Benefit-Cost Ratio could not be compared without discounting the former one with that of latter two crops. Undertake a study of shifting cultivation to mango.

5. Carryout value chain study as supply of chilly do not remain stable enough. Research program related to marketing issue should develop in consultation with marketing experts.

6. Identify increasing or decreasing trend and reasons behind floating bed cultivation tradition. Identify the major constraints of the floating bed cultivation method and options to remove those constraints.

7. A national level of seminar/workshop on 'Export and Import parity analysis of selected vegetable and spices in Bangladesh" could help to inform the policy makers about what could be the agricultural trade policy of the country.

8. Identify the constraints of adoption of BARI oilseed variety and offer the policy options to remove those constraints. Study the seed supply problem of the BARI varieties. Sunflower should be included in this study.

9. Identify how many farms households actually get access to institutional credit and the constraints of access to credit changing over time. Macro level data on credit should be compared with the data collected from farm household survey.

Bangladesh Rice Research Institute

1. In returns to investment of rice research, popular rice varieties should be considered.

2. Estimation of cost and return of Modern rice varieties cultivation at the Farm level should be checked.

3. Agricultural Economics Division should reduce the total number of the study and sort the research program based on priority.

Bangladesh Sugarcane Research Institute

1. In estimating the growth rate efficiently, structural change analysis should be carried out with chow test of econometric method.

2. Comparative economics of Gur and sugar such as per unit cost of production and their price difference in different marketing channel, mill zone and international market should be carried out.

3. Should do financial analysis because the economic analysis would be complex job for them.

Bangladesh Institute of Nuclear Agriculture

1. The term "Economic analysis should be replaced by the term "financial analysis as the data were generated from farm level survey
2. The house suggested undertaking a study on comparative economics between BINA dhan8 and BRRIdhan47 to examine actual economic profitability.
3. Adoption study on BINA rice varieties should be undertaken by the division.
4. The house suggested to take less programme and so that they can do the research efficiently.

Computer & GIS

During the period 2012-13, two training programs and one workshop was organised. These are listed below:

Training/Workshop Organized

Application software for office management. 5 days (26-30 May 2013). Participants: 20 officers of NARS, organized by Computer & GIS Unit, BARC.

ICT and MIS application for NARS. 5 days (31 March-4 April 2013). Participant: 20 officers of NARS, organized by Computer & GIS Unit, BARC.

Nutrition

Awareness building on the importance of nutrition information and Quality processing and Preservation of Agro-products

During the year 2012-2013, Bangladesh Agricultural Research Council and Bangladesh Institute of Research, Training and Applied Nutrition (BIRTAN) jointly organized a total of 4 training programme namely i) *Awareness building on the importance of nutrition information* and ii) *Quality processing and Preservation of Agro-products* in Teknaf (23-25 March 2013), Rangpur (16-18 April 2013), Rangamati (19-22 May 2013) and Chapainabagonj (17-20 June 2013) respectively under the support of core research fund of BARC. A total of 30 participants were attended in each batches of the training programme. In the first programme, course was organized to disseminate the messages on food based nutrition with the view that acquired knowledge would be transferred to the students, which might be transmitted to the family members and neighbours. On the otherhand, small entrepreneurs & NGOs representatives were participated in the second programme. This course was conducted with the view to improve their skill and knowledge in food processing and preservation technique of perishable vegetables and fruits, in particular.

Certificate distribution among the participants of Quality processing and Preservation of Agro-products Training programme

The courses were designed with multidisciplinary sectors in the following subjects *viz.,* agriculture products, fishery, food hygiene, sanitation, safe food and food security, improvement of nutrition level, different toxic chemicals use in foods, arsenic problems, processing and preservation techniques of fruits and vegetables, quality control, etc. were emphasized.

In these programmes, Director (Nutrition) of BARC was present as chief guest in different sessions of inaugural and certificate giving ceremony. The Deputy Director of DAE in respective districts and Mr. Mahfuzur Rahman, PSO of BIRTAN were present as special guest. Mr. Mozzamel and Md. Jotilal Barua Scientific personnel was also present in all of these training programme. However. under the SPGR sub-project, to create awareness among the stakeholders about food safety measures and protocols particularly for milk and fish/fish products. BARC coordination unit during the reporting period implemented four training programs at different locations of the country.

Workshop on Review of Annual Progress, Expert consultation Meeting and Safe Use of Chemicals

During the reporting period the sub-project coordination unit organized four workshops centrally. The first one was organized to mid-term review the research progress of the component projects on Sept 03, 2012 at the conference room of BARC, Dhaka. While the other two workshops, expert's consultation meetings and review discussion and preparation of recommendation note on the research findings of the project so far achieved were held on 18.10.12 and 15.05.13 at BARC conference room. However, another special workshop on Safe use of Chemicals in fruit production and mango ripening was held on

22.06.13 at the Upazila Auditoriun of Volahat, Chapainababgonj. The participants of the workshops were mainly the mango growers of the greater Rajshahi districts, local journalist and members of the Volahat mango foundation. The Workshop was chair by the Dr. Wais Kabir, Executive Chairman of BARC.

Manpower Development Activities

During the reporting period (July 2012 to June 2013) a total of 4,706 scientists/officers from the NARS institutes/ Ministry of Agriculture participated in the NATP/Revenue funded training/workshop/higher study/ study visit programs at home and abroad. It may be mentioned that 1523 scientists/officers attended the revenue funded training/workshop/ higher study programs while the remaining 3183 scientists/officers participated in the NATP funded training/workshop/ higher study/ study visit programs at home and abroad.

The major activities that Manpower and Training Unit has accomplished/ helped implementation during the reporting period are delineated below.

Foundation Training

The closing session of the 23rd Foundation Training Course of the National Agricultural Research System (NARS) scientists was held on May 22, 2013 at Bangladesh Academy for the Rural Development (BARD) in Comilla. The course duration was four months from January 23, 2013 to May 23, 2013 in which 40 officers took part. The program was conducted by BARD Comilla and sponsored by Bangladesh Agricultural Research Council (BARC), Dhaka. The newly recruited Scientific Officers from different NARS institutes were the participants in this course.

Presided over by Dr. AK Sharifullah, Director (Project), BARD, the meeting was addressed among others by Dr. Kamrul Ahsan, Director Training, BARD. Mr. Md. Aminuzzaman, Director (Manpower & Training), BARC attended the program as guest of honour. The course was inaugurated on January 23, 2013. The inaugural session was presided over by the Director General of BARD Mr. Md. Moshiur Rahman. Dr. Wais Kabir, Executive Chairman of BARC and Mr. Md. Aminuzzaman, Drirector (Manpower and Training), BARC attended the program as chief guest and special guest respectively.

The main objective of the course was to create a base for developing a corps of well-groomed NARS scientists, dedicated to the welfare for the nation and people in a changing global context. This four-month long training course contents include major five areas including Bangladesh Studies, Public Administration, Development Economics, Skill Development and other modules in promising areas. The program was financed by PIU-BARC:NATP Phase I.

Training Program on Administrative and Financial Management

BARC organized a 14-day Training Program on Administrative and Financial Management during 9-22 March 23, 2013 at Bangladesh Academy for Rural Development, Kotbari, Comilla. A total number of 40 PSOs and CSOs from different NARS institutes participated in the program. The objective of the training program was to provide these senior level scientists/ researchers with the modern concepts of administrative and financial management system.

The training program was inaugurated by Mr. Md. Aminuzzaman, Director (Manpower and Training), BARC on March 9, 2013 who attended the program as the Guest of Honour. Presided over by Mr. Md. Moshiur Rahman, Director General of BARC the meeting was addressed among others by Mr. Md. Kamrul Ahsan, Director (Training) of BARD.

In Country PhD (Revenue)

One of the major tasks of Manpower of Training Unit of BARC is to offer higher studies for NARS scientists in various disciplines of agriculture and beyond. During 2008-2009 a number of 18 in country PhD slots were offered to the scientists/professionals of NARS. Fund in this connection was released for those candidates pursuing PhD. Almost all the PhD fellows joined their respective institutes upon completion their PhD program for the period of 2009-2012. Meanwhile, fresh applications have been sought from the NARS institutes for the revenue funded in-country PhD Program for the period of 2013-2016.

In Country PhD (CSISA-BARC Scholarship Progam)

There was a provision of five slots for in-country PhD under CSISA-BARC Scholarship Program. Three officers- one from BARC and two from BARI are pursuing PhD and remaining two- one from BFRI (fisheries) and other from BINA are under admission process. The program is being jointly funded by CSISA-BD, IRRI and WorldFish Centre.

In Country PhD (PIU-BARC): NATP Phase 1

Under PIU-BARC, NATP: Phase-1 there were provisions of 60 national PhD scholarships in various fields of agriculture. During the reporting period all of 60 PhD scholars are pursuing their courses and research work in different public universities within the country. The PhD scholarships were distributed among the NARS institutes as BARI-25, BRRI-10, BJRI-7, BSRI-5, BINA-3, SRDI-4, BFRI (fish)-4, BTRI-1 and MoA-1. It may be mentioned here that all of PhD scholars' have already completed their courses and most of them completed their field research. All costs in connection with their PhD programs were provided timely in their respective universities. Of the 60 PhD Scholars 51 were sent abroad under Literature Review Program.

In addition, under SPGR sub-projects nineteen scholars are pursuing their PhD degree in different universities in Bangladesh.

Foreign PhD (PIU-BARC) NATP

Again, under the PIU-BARC: National Agricultural Technology Project (NATP) Phase-1, a number of 30 slots were earmarked for foreign PhD programs for the scientists of National Agricultural Research System (NARS) and all the selected PhD scholars have taken admission in the universities of different countries like Malaysia, Thailand, China, Philippines, India and Sri Lanka. On receipt of progress reports scholars' allowances and research grants are being released. Some of the scholars have completed their PhD and the remaining will complete their PhD program by 2014. It is hoped that the scholars through their knowledge in agriculture gained abroad would enrich and accelerate the scientific advancement in Bangladesh agriculture.

Post-doctoral fellowships abroad

As per provision of the RDPP of NATP Phase –I, there were 10 slots for post-doctoral fellowships for a period of 6-8 months of which all 10 post-doctoral fellowships have been selected for developing /developed countries. Of them, six scholars have already completed their post-doctoral fellowships while the remaining four are abroad in this connection.

Foreign Training/seminar/workshop/study tour

During the reporting period other than in country activities, Manpower and Training Unit also initiated and implemented foreign training/seminar/workshop/ meeting in different countries of the globe. A total number of 54 research managers/scientists/personnel under different fields of agriculture and cross cutting issues attended to help enrich their professionalism in order to achieve the country's ultimate goal of being self sufficient in food production. Detailed activities are furnished below:

Sl. No	Name, Desig. & Org.	Name of Program	Duration	Country	Funding org.
01.	Dr. Wais Kabir, Executive Chairman, BARC	Prioritizing Demand Driven Agricultural Research for Development in South Asia	2-4 July 2012	NewDelhi, India	IFPRI
		Executive Symposium on Food and Agri Business Management	07-17 Aug. 2012	New York, USA	ABSPII
		16th Annual Meeting of the Council for Partnership on Rice Research in Asia (CORRA)	10-14 Sept., 2012	Andhra Prodesh, India	IRRI and PIU-BARC:NATP
		Accompanying the Honourable Minister for Agriculture to Inida	06-10 Nov. 2012	New Delhi,India	PIU-BARC:NATP
		Participation in 8th Governing Council Meeting of UNAPCAEM and exchange of opinion with the PhD/ Post-doc fellows under NATP.	14-15 Dec. 2012	Bangkok, Thailand	PIU-BARC:NATP
		CRP Dry-land System Launch Meeting	21-23 May 2013	Jordan	ICARDA
02	Dr. M. Kalequzzaman A. Chowdhury, Member Director (Crops), BARC	Commission on Genetic Resources for the Food and Agriculture 21st. Ad Hoc Technical Working Group on Access and Benefit- Sharing for Genetic Resources for Food and Agriculture	11-13 September, 2012	Norway	Govt. of Norway
		12th. International Symposium on the Bio-Biosafety of Genetically Modified Organism	16-20, September, 2012	St. Louise, Missouri, USA	Center for Environmental Risk Assessment (CERA)
		Meeting of the Ad Hoc Technical Committee on Sustainable Use for Plant Genetic Resources for	8-9, Nov , 2012	Rome, Italy	FAO434-0

		Food and Agriculture			
		Ist. Regional meeting of the project " Enhancing understanding and implementation of the International Treaty of Plant Genetic Resources for food and Agriculture (It-PGRFA)	27-28 May, 2013	Thailand	FAO
		2nd. Regional Workshop on " Capacity Building in Biosafety"	17-20 May, 2013	Thailand	FAO
		SAARC Regional Conference on New Frontier in Agricultural Genomics and Biotechnology	5-7 June, 2012	Islamabad, Pakistan	NATP
03.	Dr. S M Khalilur Rahman, Member Director (AERS) CC, BARC	Second Network Meeting of SATNET Asia & High-level Policy Dialogue on Technology Transfer for Smallholder Farmers	12-13 February, 2013	Indonesia	CAPSA
04	Dr. Abul Kalam Azad, Director, SAC and CSO (Crops), BARC	Meeting of Directors of SAARC Regional Centers	30 – 31 July, 2012	SAARC Secretariat, Katmandu, Nepal	SAC
		To attend Inaugural Program & Monitoring of Training Program on Quality Seed Production through Brood-fish Management in SAARC Countries"	01-02 October, 2012	Vubenassawa India	SAC
		Coastal and Marine Fisheries Management in SAARC Coastal Countries & Forty-third Session of Programming Committee Meeting of SAARC	20-21 Nov, 2012 and 11-13 December, 2012	Maldives and Nepal	SAC
		Forty-third Session of the Programming Committee of SAARC	3-5 January, 2013	Nepal	SAC
		AFACI International Symposium and Evaluation Meeting of AFACI Country Projects	17-22 June, 2013	Suwon, Korea	AFACI
05	Md. Aminuzzaman, Director (Manpower & Training), BARC	Regional Consultation on Collective Action for Opening Access to Agricultural Information & Knowledge in the Asia –Pacific Region	13-15 December, 2012	Bhutan	APAARI
06	Mr. Abeed Hossain Chowdhury, Director (Computer & GIS), BARC	AgMip South Asia kick-off Workshop	11-16 Nov, 2012	Sri Lanka	AgMip
07	Dr. Sultan Ahmmed, CSO (Agg. Engg.), BARC	Seminar on Disaster Management of Damaged Irrigation and Water Management Facilities for Agriculture (JI230008)	28 Nov -08 December, 2012	Japan	JICA
		Delegation team of Monitoring on the Performance of "Axial Flow Pump (AFP) Technology"	30 April – 5 May, 2013	Thailand	iDE Bangladesh /CIMMYT Bangladesh
08	Mrs. Dil Afroz, Director (AIC), BARC	FutureGov SAARC Summit	25-26 June, 2013	Srilanka	FutureGov SAARC Summit/ICT Agency of Sri Lanka
09	Dr. ASM Khorshed Alam, Principal Scientific Officer (Crops), BARC	Workshop on Biosafety Management Approach to Product Development and Regulation	21-23 January, 2013	Hyderabad, India	ABSP II
10.	Dr. Shaikh Mohammed Bokhtiar, PSO (Soil), BARC	Meeting on New AFACI Project "Production and Service of Agrometerological Information for Adaptation to Climate Change"	24-28 September, 2012	Suwan, the Republic of Korea	AFACI
		International Symposium on Soil and Plant Analysis, Queenstown	08-12 April 2013	New Zealand	PIU-BARC:NATP
11.	Dr. Md. Jalilur Rahaman, PSO (Fisheries), BARC	(1) Training Program on "Quality Seed Production through Brood-fish Management in SAARC Countries" & (2) Managing Trans-Boundary Diseases of Agricultural Importance in Asian-Pacific	1-10 October, 2012	Urissayh and New Delhi, India	NATP/SAC & ICAR
		Consultation meeting on Coastal and Marine Fisheries Management in SAARC Coastal Countries	20-21 Nov, 2012	Maldives	SAC
12	Dr. Mian Sayeed Hassan, Principal Scientific Office (Crops), BARC	New AFACI Project Meeting on "Enhancement of network and model manual on post harvest technology of horticultural crops in Asia	10-14 September, 2012	Suwan, the Republic of Korea	AFACI
		New AFACI Project Meeting on "Development of locally-appropriate GAP programme and agricultural produce safely information system	24-28 September, 2012	Suwan, the Republic of Korea	AFACI

		AFACI Workshop on Good Agriculture practice (GA)	13-17 May, 2013	Vietnam	AFACI
13.	Dr. Nazmun Nahar Karim, PSO (Ag. Eng.), BARC	Delegation team of Monitoring on the Performance of "Axial Flow Pump (AFP) Technology"	30 April – 5 May, 2013	Thailand	iDE Bangladesh /CIMMYT Bangladesh
14.	Mr.Hasan Md. Hamidur Rahman, Senior System Analyst, BARC	Expert Workshop on Agricultural Technology Information Network (ATIN) of AFACI	26-30 Nov, 2012	Sri Lanka	AFACI
15.	Dr. Md. Abdus Salam, PSO (P&E), BARC	Training Workshop on launch of CRAT : CCAF's Regional Agricultural Forecasting Toolkit	9-11 May, 2013	New Delhi, India	Climate Change , Agriculture and Food Security (CCAFS)
16.	Mr. Md. Rafique Mostafa Kmal, Senior Documentation Officer, BARC	Workshop on Use of Information nTechnology in Irrigation Management for Small Scale Farming Communities in Rural Areas	25-27 December, 2012	Pakistan	COMSATS
17.	Mrs. Honeara Ferdous, Junior Bibliographic Officer, BARC	First Short Term Training Course on Application of Information Resources (NISCAIR)	17 Sept -19 October, 2012	New Delhi, India	Air Fare (GoB) BANSDOC & BARC (Rev)
18	Dr. Md. Abul Kalam Azad, Director (CC), JTPDC, BJRI	Study tour: Wool Research Association (WRA), Maharashtra, The Bombay Textile Research Association (BTRA). Mumbai, Indian Institute of Technology (IIT), New Delhi and Indian Jute Industries' Research Association (IJIRA), Kolkata	10-18 January 2013	India	PIU-BARC: NATP
19	Dr. Nazmina Chowdhury, Principle Scientific Officer,BJRI	Study tour: Wool Research Association (WRA), Maharashtra, The Bombay Textile Research Association (BTRA). Mumbai, Indian Institute of Technology (IIT), New Delhi and Indian Jute Industries' Research Association (IJIRA), Kolkata	10-18 January 2013	India	PIU-BARC: NATP
20	Shamina Jafrin, Senior Scientific Officer (CC), BJRI	Study tour: Wool Research Association (WRA), Maharashtra, The Bombay Textile Research Association (BTRA). Mumbai, Indian Institute of Technology (IIT), New Delhi and Indian Jute Industries' Research Association (IJIRA), Kolkata	10-18 January 2013	India	PIU-BARC: NATP
21	Dr. Md. Mukhlesur Rahman, Director, BARI	Develop Agricultural Technology Related Cooperation between BARI and China, Science and Technology Department of Yunnan Province	18-21 March 2013	China	PIU-BARC: NATP
22	Dr. Md. Lutfur Rahman, Chief Scientific Officer, Training and Communication Wing, BARI	Develop Agricultural Technology Related Cooperation between BARI and China. Science and Technology Department of Yunnan Province	18-21 March 2013	China	PIU-BARC: NATP
23	Dr. Md. Abdul Jalil Bhuyan, Director (Support & Service),BARI	Tropical Fruits, University of Queensland and other related organizations	13 April 2013 to 22 April 2013	Australia	PIU-BARC: NATP
24	Dr. Madan Gopal Saha, Chief Scientific Officer, Pomology Division.BARI	Tropical Fruits, University of Queensland and other related organizations	13 April 2013 to 22 April 2013	Australia	PIU-BARC: NATP
25	Dr. Monoranjan Dhar, Principal Scientific Officer, RARS,BARI	Tropical Fruits, University of Queensland and other related organizations	13 April 2013 to 22 April 2013	Australia	PIU-BARC: NATP
26	Dr. Babul Chandra Sarker, Principal Scientific Officer, Pomology Division,BARI	Tropical Fruits, University of Queensland and other related organizations	13 April 2013 to 22 April 2013	Australia	PIU-BARC: NATP
27	Mr. Abdul Mannan, MP	Agricultural Development	07 May to 19 May 2013	Philippines, Vietnam and Thailand	PIU-BARC: NATP
28	Mr. Shah Jikrul Ahmed, MP	Agricultural Development	07 May to 19 May 2013	Philippines, Vietnam and	PIU-BARC: NATP

				Thailand	
29	Mr. Mohd Monirul Islam, MP	Agricultural Development	07 May to 19 May 2013	Philippines, Vietnam and Thailand	PIU-BARC: NATP
30	Ms. Noorjahan Begum, MP	Agricultural Development	07 May to 19 May 2013	Philippines, Vietnam and Thailand	PIU-BARC: NATP
31	Mr. Md. Mustafizur Rahman, Senior Training Officer	Agricultural Development	07 May to 19 May 2013	Philippines, Vietnam and Thailand	PIU-BARC: NATP
32	Dr. Meraz Uddin Ahmed, Member Director (Admin and Finance),BARC	Quality Management and Good Governance in the Agricultural Research Sector and monitoring of PhD participant, University of Jakarta and UPM	12-17 May 2013 and 18-19 May 2013	Indonesia and Malaysia	PIU-BARC: NATP
33	Mr. Md. Siddiqur Rahman, Deputy Chief, MoA	Quality Management and Good Governance in the Agricultural Research Sector and monitoring of PhD participant , University of Jakarta and UPM	12-17 May 2013 and 18-19 May 2013	Indonesia and Malaysia	PIU-BARC: NATP
34	Mr. Shawkat Momen Shahjahan MP	Agricultural Development	21 May to 03 June 2013	Philippines, Vietnam and Thailand	PIU-BARC: NATP
35	Mr. Kh. Abdul Baten MP	Agricultural Development	21 May to 03 June 2013	Philippines, Vietnam and Thailand	PIU-BARC: NATP
36	Mr. Abul Kalam Azad MP	Agricultural Development	21 May to 03 June 2013	Philippines, Vietnam and Thailand	PIU-BARC: NATP
37	Mrs. Ahmed Nazmin Sultana MP	Agricultural Development	21 May to 03 June 2013	Philippines, Vietnam and Thailand	PIU-BARC: NATP
38	Mr. Md. Hemayet Hossain, Deputy Secretary, MoA	Agricultural Development	21 May to 03 June 2013	Philippines, Vietnam and Thailand	PIU-BARC: NATP
39	Dr. Kamal Humayun Kabir, DG, BSRI	Training and Visit Program on Sugarcane and Sugar beet, Indian Institute of Sugarcane Research (IISR)	21-30 June 2013	Lucknow, India	PIU-BARC: NATP
40	Mr. Jamshed Ahmed Khandker, Joint Secretary, MoA	Training and Visit Program on Sugarcane and Sugar beet (IISR)	21-30 June 2013	Lucknow, India	PIU-BARC: NATP
41	Dr. M. Khalilur Rahman, CSO, BSRI	Training and Visit Program on Sugarcane and Sugar beet, (IISR)	21-30 June 2013	Lucknow, India	PIU-BARC: NATP
42	Dr. Shaikh Abdul Mannan, CSO, BSRI	Training and Visit Program on Sugarcane and Sugar beet, (IISR)	21-30 June 2013	Lucknow, India	PIU-BARC: NATP
43	Mr. Md. Rafiqul Islam, CSO, BSRI	Training and Visit Program on Sugarcane and Sugar beet, (IISR)	21-30 June 2013	Lucknow, India	PIU-BARC: NATP
44	Dr. Md. Shamsur Rahman, SSO, BSRI	Training and Visit Program on Sugarcane and Sugar beet, (IISR)	21-30 June 2013	Lucknow, India	PIU-BARC: NATP
45	Mr. Md. Hasibur Rahman, SO, BSRI	Training and Visit Program on Sugarcane and Sugar beet, (IISR)	21-30 June 2013	Lucknow, India	PIU-BARC: NATP
46	Dr. A F M Mahfuzul Haque, SSO, BARI	Asian Food Security Association (AFSA) Conference, Osaka Prefecture University	Japan	15-17 September 2012	PIU-BARC:NATP
47	Dr. Md. Illias Hossain, Senior Scientific Officer, Regional Wheat Research Center,BARI	International Conference on 20 Years of Conservation Agriculture, Beijing,	China	19-21 Nov 2012	PIU-BARC:NATP
48	Mr. Kuasha Mahmud, Senior Scientific Officer, Biotechnology Division ,BSRI	International Symposium on New Paradigms in Sugarcane Research, Coimbatore, Tamil Nadu	India	15-18 October 2012	PIU-BARC:NATP
49	Dr. Md. Mukhlesur Rahman, Director (T&C),BARI	5th International Symposium for the Development of Integrated Pest Management for Sustainable Agriculture in Asia and Africa, MARDI	Malaysia	18-20 December 2012	PIU-BARC:NATP

50	Dr. Salina Parvin Banu, PSO, Research Wing, BARI	5th International Symposium for the Development of Integrated Pest Management for Sustainable Agriculture in Asia and Africa, MARDI	Malaysia	18-20 December 2012	PIU-BARC:NATP
51	Dr. Md. Abdul Jalil Bhuyan, Director (Support & Service), BARI	Volarization of Traditional Processing of Indigenous and Underutilized Fruits ,Phnom Penh	Cambodia	14-16 January 2013	PIU-BARC:NATP
52	Dr. ASM Masuduzzaman, Principal Scientific Officer, Plant Breeding Division, BRRI	International Conference on Crop Management in Changing Climate ,Faisalabad	Pakistan	11-13 February 2013	PIU-BARC:NATP
53	Dr. Md. Abul Khayer Mian, Senior Scientific Officer, Regional Agricultural Research Center, BARI	International Conference on Crop Management in Changing Climate, Faisalabad	Pakistan	11-13 February 2013	PIU-BARC:NATP
54	Mst. Marufa Sultana, SO, Soil Science Division, BARI	4th International Symposium on Soil Organic Matter-2013 ,Nanjing	China	05-10 May 2013	PIU-BARC:NATP

Implementation Status of Literature Review Program Abroad for the in-country PhD Scholars under PIU-BARC, NATP

Under PIU-BARC: NATP 60 NARS scientists were offered in-country PhD and of them 51 have completed literature review program abroad during the reporting period. The list is given below:

Sl. No.	Name & Designation	Org.	Name of Tropic	Venue	Country	Duration
0 1	Md. Kamrul Islam, SSO, ARS, Burirhat, Rangpur	BARI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
02	Md. Shakhawat Hossain, SSO, On-Farm Research Division, Regional Wheat Research Center	BARI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
03	Nazma Akther, SO, Wheat Research Center	BARI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
04	Begum Samia Sultana, SO, District Office	SRDI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
05	Md. Ashraful Alam, SSO, RHRC	BARI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
06	Sarker Saifun Kakon, SO, Agronomy Division	BARI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
07	Shymal Brahma, SSO, Speices Research Center	BARI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
0 8	Mst. Fahmina Yasmine, SO, Plant Breeding Division	BINA	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
09	Md. Anayet Ullah, SO, Regional Laboratory	SRDI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
10	A.T.M Sakkawat Hossain, SSO, Soil Science Division	BRRI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
11	Md. Asaduzzaman, SSO, On-Farm Research Division	BARI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
12	Ms. Sharmin Akter, SO	SRDI	Review of Literature	Kasetsart University	Thailand	19 May 2013 to 17 June 2013
13	Md. Akhtar Hossain, SSO, On-Farm Research Division	BARI	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
14	Md. Kamrul Hasan, SSO, Spices Research Center	BARI	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
15	Md. Azharul Islam, SSO, Training and Technology Transfer Division	BSRI	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
16	Md. Shamima Begum, SO, TCP Division	BINA	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
17	Md. Saiful Islam, SSO, Agricultural Economics Division	BRRI	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
18	Md. Mosharraf Uddin Molla, SSO, Farm Management Unit	BJRI	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
19	Md. Lutfar Rahman, SSO, Regional Station	BJRI	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013

Sl. No.	Name & Designation	Org.	Name of Tropic	Venue	Country	Duration
20	Mohammad Mohiuddin, SO, Agricultural Economics Division	BARI	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
21	Shah Md. Helal Uddin, Officer on Special Duty (Senior Assistant Chief)	MoP	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
22	Biswajit Karmakar, SSO, Adaptive Research Division	BRRI	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
23	Md. Harun-Ar-Rashid, SSO, Rice Farming System Division	BRRI	Review of Literature	University of the Philippines Los Banos	Philippines	28 May 2013 to 25 June 2013
24	Jasmine Ara Chowdhury, SSO, Agronomy Division	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
25	Md. Masud Alam, SSO, Spices Research Cente	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
26	Md. Habibur Rahman, SSO, Vegetable Division	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
27	Mohammad Kamrul Hasan, SSO, On-Farm Research Division	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
28	Md. Abdur Razzaque, SSO, Agronomy Division	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
29	Md. Ruhul Amin, SSO, On-Farm Research Division,	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
30	Md. Mahbubur Rahman Salim, SSO, Agricultural Research Station	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
31	Md. Shawquat Ali Khan, SSO, Agronomy Division	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
32	Saiyera Chowdhury, SO, Soil Science Division	BINA	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
33	Md. Mahfuz Bazzaz, SSO, Wheat Research sub-Center	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
34	Anjuman Ara Begum, SSO, Agronomy Division	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
35	A.T.M. Anwarul Islam Mondol, SSO, Soil Science Division	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
36	Sarker Md. Abu Hena Mostofa Kamal, SSO, Agricultural Research Station	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
37	Mrs. Quamrun Naher, SSO, On-Farm Research Division	BARI	Review of Literature	Kasetsart University	Thailand	11 June 2013 to 08 July 2013
38	Latifa Yasmin, SSO, Plant Pathology Section, Horticulture Research Center	BARI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
39	Md. Nazrul Islam, SSO, Pest Management Division	BJRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
40	Abul Kashem Md. Shahadat Hossain, SSO, Jute Research Regional Center	BJRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
41	Md. Rahimul Alam, SO, Breeding Division	BSRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
42	Mst. Kohinoor Begum, SSO, Physiology and Sugar Chemistry Division	BSRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
43	Shalina Akhter, SSO, Regional Sugar Research Center	BSRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
44	Saleh Md. Ashraful Haque, SO, Plant Pathology Department, Pest Management Division	BJRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
45	Md. Abul Fazal Mollah, SSO, Regional Station	BJRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
46	Md. Shariful Islam, SO, Physiology and Sugar Chemistry Division	BSRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
47	Shahnaz Parveen, SSO, Adaptive Research Division	BRRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
48	Md. Masroor Anwer, SSO, Textile Physics Division	BJRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
49	Md. Mosaddeque Hossain, SSO, Entomology Division, BRRI Regional Station	BRRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
50	Md. Aminul Islam, SSO, Soil Science Division	BARI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013
51	Md. Nazmul Bari, SSO, Entomology Division	BRRI	Review of Literature	University of the Philippines Los Banos	Philippines	18 June 2013 to 16 July 2013

Implementation status of short-term training abroad under PIU-BARC:NATP Phase 1

During the reporting period 61 NARS scientists/officers have received short term training from abroad on different issues of agricultural research and development.

Sl. No	Name, Desig. & Org.	Name of the Program	Name of University/ Institute/ Venue	Duration
1.	Mst. Bilkis Banu, SO, Soil Science Division, BARI	Biogas Technology 2012	Yunnan Research Center of Biogas Engineering & Technology, Kunming, China	15 July to 03 August 2012
2.	Dr. Md. Abdus Satter, CSO, Soils, BARC	Designing and Implementing Agro-Input Marketing Strategies in Developed and Developing Countries	Alabama, Kentucky, Missouri, Illinois, Maryland and Washington, D.C	23 July to 03 August 2012
3.	Dr. Rowshan Ara Begum, PSO, Soils, BARI	Designing and Implementing Agro-Input Marketing Strategies in Developed and Developing Countries	Alabama, Kentucky, Missouri, Illinois, Maryland and Washington, D.C	23 July to 03 August 2012
4.	Dr. Md. Nazirul Islam, PSO, RARS, Barisal, BARI	Coconut Mite	Tamil Nadu Agricultural University, India	23-29 July 2012
5.	Dr. Mst. Shamsunnahar, SSO, Pathology Division, HRC, BARI	Coconut Mite	Tamil Nadu Agricultural University, India	23-29 July 2012
6.	Md. Ishaqul Islam, SSO, RARC, Jessore, BARI	Coconut Mite	Tamil Nadu Agricultural University, India	23-29 July 2012
7.	Nirmal Kumar Datta, SSO, Entomology Division,	Coconut Mite	Tamil Nadu Agricultural University, India	23-29 July 2012
8.	Dr. Kabita Anju-Man-Ara, PSO, BARI	Dendrobium Cultivation Techniques	Yunnan Rural Science and Technology Service Centre, Kunming, China	01-20 August 2012
.9.	Dr. Amzad Hossain, CSO, BSRI	Agricultural Biotechnology	Michigan State University, USA	09-21 September 2012
10.	Dr. Md. Mahboob Hussain, PSO, BJRI	Agricultural Biotechnology	Michigan State University, USA	09-21 September 2012
11.	Mr. Khandaker Abu Md. Mustafizar Rahman, SO, BARI	Agricultural Biotechnology	Michigan State University, USA	09-21 September 2012
12.	Mr. Mohammad Mazharul Karim, SO, BARI	International Vegetable Training Course, Vegetables: From Seed to Table and Beyond, 10 Sep- 30 Nov 2012	AVRDC, Thailand	10 September to 30 Nov 2012
13.	Mr. Md. Rabiul Islam, SO, BARI	International Vegetable Training Course (IVTC), "Vegetables: From Seed to Table and Beyond, 10 September to 30 Nov 2012	AVRDC, Thailand	10 September to 30 Nov 2012
14.	Mst. Taslima Jahan, SO, BARI	International Vegetable Training Course (IVTC), "Vegetables: From Seed to Table and Beyond, 10 September to 30 Nov 2012	AVRDC, Thailand	10 September to 30 Nov 2012
15.	Dr. Md. Saiful Islam, Principal Scientific Officer, ASICT Division, BARI	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012
16.	Mohammad Mukhlesur Rahman, Scientific Officer, ASICT Division, BARI	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012
17.	Md. Zahid Hassan, Executive Engineer, Building & Construction Division, BRRI	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012
18.	Ahmed Ali, System Analyst, BJRI	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012
19.	Md. Munir Hossain, Scientific Officer, BSRI	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012
20.	Mohammad Lutful Haque, System Analyst, BLRI	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012
21.	Khondakar Sumsul Arefin, Senior Scientific Officer (CC), BINA	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012
22.	Md. Shohid Uddin Bhuyan, System Analyst, BARC	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012
23.	G M Faysal Ahmad, Assistant Programmer, MoA	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012
24.	Mihir Kanti Sarkar, Data Entry Officer, BARC	Customized Training Program on Web Programming	Universiti Kuala Lumpuer, Malaysia	04 Nov to 01 December 2012

Sl. No	Name, Desig. & Org.	Name of the Program	Name of University/ Institute/ Venue	Duration
25.	Md. Abu Taleb, Deputy Secretary, MoA	Agricultural Project Planning, Monitoring and Evaluation	Chiang Mai University in Thailand	11 Nov to 08 December 2012
26.	Khondoker Muddasir Bin Ali, Assistant Chief , MoA	Agricultural Project Planning, Monitoring and Evaluation	Chiang Mai University in Thailand	11 Nov to 08 December 2012
27.	Mr. Muhammad Monirul Islam, Principal Scientific Officer, P & E Unit, BRRI	Agricultural Project Planning, Monitoring and Evaluation	Chiang Mai University in Thailand	11 Nov to 08 December 2012
28.	Dr. S M Mahbub Ali, PSO (CC), Planning, Training and Communication Division, BJRI	Agricultural Project Planning, Monitoring and Evaluation	Chiang Mai University in Thailand	11 Nov to 08 December 2012
29.	Dr. Sayeeda Khatun, SSO, Agricultural Economics Division, BSRI	Agricultural Project Planning, Monitoring and Evaluation	Chiang Mai University in Thailand	11 Nov to 08 December 2012
30.	Dr. Md. Abdul Awal, PSO, P& E Division, BARC	Agricultural Project Planning, Monitoring and Evaluation	Chiang Mai University in Thailand	11 Nov to 08 December 2012
31.	Dr. Md. Habibur Rahman, SSO (CC), Planning and Development Cell, BINA,	Agricultural Project Planning, Monitoring and Evaluation	Chiang Mai University in Thailand	11 Nov to 08 December 2012
32.	Mr. Md. Abu Baker Siddique, SO, GRS Division, BRRI	Regional Training Program on "Quality Seed Production, Processing, Testing and Certification of Rice and Vegetables	Sri Lanka	02-13 December 2012
33.	Mr. Md. Nazmul Islam, SO, Seed Technology Division, BARI	Regional Training Program on "Quality Seed Production, Processing, Testing and Certification of Rice and Vegetables	Sri Lanka	02-13 December 2012
34.	Mr. Md. Azim Uddin, Chief Seed Technologist, Seed Wing, BARI ,	Regional Training Program on "Quality Seed Production, Processing, Testing and Certification of Rice and Vegetables	Sri Lanka	02-13 December 2012
35.	Mr. Muhammad Rezwan Kabir, Scientific Officer, Biotechnology Division,	Plant Biotechnology	James Hutton Institute, Scotland, UK	28 February 2013 to 28 May 2013
36.	Mr. Kamal Uddin Ahamed, Scientific Officer, PGRC, RARS, BARI	International Course on Plant Conservation Biology Science and Practice	New Delhi, India	01-14 March, 2013
37.	Mr. Md. Farhad, Scientific Officer,WRC, BARI	Training on Basic Wheat Improvement Course	CIMMYT, Mexico	01 March 2013 to 31 May 2013
38.	Mr. Mohammad Monwar Hossain, Scientific Officer, Wheat Research Center, BARI	Training on Basic Wheat Improvement Course	CIMMYT, Mexico	01 March 2013 to 31 May 2013
39.	Dr. Md. Al-Amin Hossain, SSO, BARI	Litchi Breeding	South China Agricultural University, Guangzhou, China	15 March 2013 to 15 June 2013
40.	Mr. Md. Jillur Rahman, SSO, BARI	Litchi Breeding	South China Agricultural University, Guangzhou, China	15 March 2013 to 15 June 2013
41.	Mr. Mohammad Jillur Rahman, SSO, BARI	Litchi Breeding	South China Agricultural University, Guangzhou, China	15 March 2013 to 15 June 2013
42.	Most. Marufa Khatun, SO, BARI	Litchi Breeding	South China Agricultural University, Guangzhou, China	15 March 2013 to 15 June 2013
43.	Dr. Mohammad Khalequzzaman, PSO & Head, Genetic Resource and Seed Division, BRRI	Post PhD Program on Genomic Analysis including micro-satellite assays	Portsmouth University, UK	7 April 2013 to 06 July 2013
44.	Dr. Shah Md. Zikrul Haq Chowdhury, CSO (Livestock) Current Charge, BARC	Molecular Technique in Diagnosis of Diseases of Farm Animals and Poultry	Madhapradesh, India	22 April 2013 to 01 May 2013
45.	Mst. Dilafroza Khanam, PSO, BARI	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
46.	Dr. Mahmuda Khatun, SSO, BARI	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
47.	Dr. Md. Khalid Jamil, SSO, BARI	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
48.	Md. Rezwan Molla, SO BARI,	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
49.	Haimonti Barua, SO, BARI	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
50.	Md. Adil, SO, BRRI	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
51.	Liakat Ali, SO, BRRI	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
52.	Dr. Firoza Akhter, PSO, BJRI	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013

Sl. No	Name, Desig. & Org.	Name of the Program	Name of University/ Institute/ Venue	Duration
53.	Md. Maksuder Rahman, PSO (CC), BJRI	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
54.	K.M Rezaul Karim, SO, BSRI	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
55.	Dr. M A Samad, PSO, BINA	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
56.	A.K.M. Abdur Rouf, SSO, CDB	Biotechnology (Marker assisted selection breeding & biosafety)	Kasetsart University, Thailand	21 May 2013 to 05 July 2013
57.	Mr. Ajit Kumar Chakraborty D. Director (Accounts) BARC	Financial Management for Development Projects	ILO, Turin, Italy	20-31 May 2013
58.	Mr. Mohammad Abu Layes, Deputy Director (Finance), BINA	Financial Management for Development Projects	ILO, Turin, Italy	20-31 May 2013
59.	Mr. Mohammad Hussyam Uddin Parvez, PS to Executive Chairman, BARC	Financial Management for Development Projects	ILO, Turin, Italy	20-31 May 2013
60.	Mr. Hirendra Nath Barman, SSO, Plant Physiology Division, BRRI	Rice Research to Production	IRRI, Philippines	20 May 2013 to 07 June 2013
61.	Ms. Selima Zahan, SSO, Agronomy, BRR	Rice Research to Production	IRRI, Philippines	20 May 2013 to 07 June 2013

In-country Training/Seminar/Workshop

During the reporting period 11 training programs and 12 workshops were arranged by different divisions/units/centre of BARC under revenue funding in which 1515 scientists/officers took part.

Training (Revenue)

Division/ Unit	Activity	Venue	Date	No. of Part.
Crops	(a) Training on Food Safety & Phyto-sanitary measures	BARC	13-14 Feb. 2013	35
	(b) Knowledge Building and Awareness on Agricultural Policies in Bangladesh	BARC	29-30 June 2013	35
TTMU	Training Workshop for mango producers of Dinajpur district on orchard management and post harvest technology of mongo.	Dinajpur	20-21 October 2012	30
P&E	Training on Project Development and Management	BARC	10-14 Feb. 2013	25
NRM (Agril. Eng.)	Training on "Use of Farm Machinery and Efficient Irrigation System Management".	BARC/BARI/BRRI /BSRI	25-28 May 2013 1-4 June 2013	160
NRM (Forestry)	Training Workshop on Forestry Technologies for Professionals (BARC, DAE, BFIDC, BARI, DF, Universities, NGO & Others).	BARC	18-19 Feb. 2013	60
Fisheries	1.Cage Culture of fish in River (two batches, 30 each) -Participants: DoF and Pvt organizations)	Chandpur	-	60
	Brood Production of Monosex Telapia- one batch	Mymensingh	-	30
	Training on Financial Management and Project Accounting Procedure for NARS Accounts Personnel	BARC	31 January to Feb.2, 2013	40
	ICT and MIS Applications for NARS Scientists	BARC	31 Mar-4 Apr '13	20
	Application of software for office management	BARC	26-30 May 2013	20

Seminar/workshop Activities: (Revenue)

Division/ Unit	Activity	Venue	Duration	No. of Participant
(1)	(2)	(3)	(4)	(5)
Crops	Review Workshop on Crop Improvement Programme: Research Progress 2011-12 & Research Programme 2012-13	BARC	27-28 Aug. 2012	60
	Review Workshop on Crop Protection Programme: Research Progress 2011-12 & Research Programme 2012-13	BARC	29-30 Aug '12	90
	National Workshop on Research Achievement of past ten years in Horticultural Crops (Vegetables, fruits & flowers, tuber crops & spices) Research Strategies for Sustainable Production and Nutritional Security	BARC	1 Feb. 2013	155
P&E	Annual Workplan Review Workshop.	BARC	27 July 2012	50
	Field Monitoring Workshop of Research Grant Projects	BARC	19 June 2013	100
	Progress Review Workshop on Research Grant Projects	BARC	20 June 2013	100
AERS	Review of Socio-Economic Research Programs of NARS Institutes	BARC	28 June 2013	85
	Progress Review and Planning Workshop of Soils Management Program of NARS Institutes	BARC	4-6 Sep '12	80

Forestry	Review Workshop on Forestry & Agro-forestry Research Activities of NARS institutes	BARC	25-26 Feb '13	60
NRM Ag. Eng.	Agricultural Engineering Research Planning Workshop	BARC	11-12 Jun '13	90
Nutrition	National Workshop on Food Contaminants and Adulterants and its Impact on Human Health	BARC	-	80
Fisheries	Review Workshop on Fisheries Research Activities	BARC	-	50
			Sub-Total	**1000**

PIU-BARC: NATP Phase 1 Funded Training/Workshop/Seminar

Local Training (NATP)

During the reporting period, 52 national training courses were organized in various fields of agriculture with the support of the concerned divisions of BARC and NARS. These are as 1. Foundation Training for NARS entry level scientists as organized by BARD, Comilla. 2. Administrative and financial management training for NARS PSO/CSO level scientists as organized by BARD, Comilla. In the training courses there were 2217 participants, which include scientists, officers, procurement and financial management personnel of NARS institutes viz. BARI, BRRI, BJRI, BINA, BFRI (Fisheries), BFRI (Forest), BSRI, BLRI, BTRI, SRDI including BARC.

Implementation Status of local training under PIU-BARC, NATP: Phase-1 in 2012-2013.

Sl.	Name of Training	Duration	No. of Particip.	Venue
1	Procurement and Financial Management of SPGR sub-projects	25-27 Sep 2012	50	BARC Training Hall
2	Procurement and Financial Management of SPGR sub-projects	18-21 Nov '12	35	BARC Training Hall
3	Orientation Training of Farming System Research and Development	27-28 Nov '12	19	BARC Training Hall
4	Induction training of newly joined scientists of BARI	02-06 Dec '12	76	BARI Training Hall
5	ToT for UEO of newly developed varieties and technologies of BSRI	10-12 Jan 2013	30	BSRI Training Hall
6	Foundation Training Course	23 Jan-22 May 2013	40	BARD, Comilla
7	ToT for SEO of newly developed varieties and technologies of BSRTI	26-28 Jan 2013	20	BSRTI Training Hall
8	Seed Quality Management	28-30 Jan 2013	40	BARC Training Hall
9	Coconut Mite	9-11 Feb 2013	30	RARS, BARI, Barisal
10	ToT for ULO	26-28 Feb 2013	30	BLRI, Savar
11	Administrative and Financial Management for CSO/PSO of NARS Scientists	10-24 Mar 2013	40	BARD, Comilla
12	Awareness Building on the Importance of Nutrition Information	19-21 March	30	DAE, Rangpur
13	ICT and MIS application for NARS	31 Mar- 04 Apr 2013	20	Computer Center, BARC
14	Awareness Building on the Importance of Nutrition Information	01-03 April	30	DAE, Teknaf
15	ToT for UAO/UEO (BJRI technologies)	9-11 May 2013	30	BJRI, Dhaka
16	Quality Processing and Preservation of Agro-Inputs	19-22 May 2013	30	Rangamati
17	ToT for UAO/UEO (BRRI technologies)	21-23 May 2013	30	BRRI, Gazipur
18	Quality Processing and Preservation of Agro-Inputs	17-20 June 2013	30	Chapi Nababjonj
19	Modern Office Management for 3rd Class Staff of BARC	9-13 June 2013	25	Computer Center, BARC

20	Rules Discipline and Office Management for 4th Class Staff of BARC	9-13 June 2013	34	Conferenc-2, BARC
21	Modern Office Management for 3rd Class Staff of BARC	16-20 June 2013	25	Computer Center, BARC
22	Rules Discipline and Office Management for 4th Class Staff of BARC	16-20 June 2013	34	Conferenc-2, BARC
23	ToT for UFO/UEO (Fisheries technologies)	22-24 June 2013	30	BFRI, Mymensingh
24	Updated Rules & Discipline Driver of BARC	23-27 June 2013	17	Conferenc-2, BARC
25	ToT for UAO/UEO (BINA technologies)	26-28 June 2013	30	BINA, Mymensingh
26	Field experimentation, data collection and information recording for SSA-SA of BARI	5 days	30	BARI, Gazipur
27	Field experimentation, data collection and information recording for SSA-SA of BARI	5 days	30	BARI, Gazipur
28	Field experimentation, data collection and information recording for SSA-SA of BARI	5 days	30	BARI, Gazipur
29	Crop production technologies of BARI released varieties for BTV concerned SA/SSA	3 days	26	BARI, Gazipur
30	Crop production technologies of BARI released varieties for BTV concerned SA/SSA	3 days	26	BARI, Gazipur
31	Production technique, data collection, data analysis and report writing for the site coordinator of BTV	3 days	50	BARI, Gazipur
32	Technology Transfer of BARI	2 days	70	BARI, Gazipur
33	Technology Transfer of BARI	2 days	70	BARI, Gazipur
34	Technology Transfer of BARI	2 days	80	RARS, Ishurdi, Pabna
35	Technology Transfer of BARI	2 days	80	RARS, Ishurdi, Pabna
36	Technology Transfer of BARI	2 days	80	OFRD, Rangpur
37	Technology Transfer of BARI	2 days	80	OFRD, Rangpur
38	Technology Transfer of BARI	2 days	70	RARS, Jamalpur
39	Technology Transfer of BARI	2 days	70	RARS, Jamalpur
40	Technology Transfer of BARI	2 days	80	RARS, Jessore
41	Technology Transfer of BARI	2 days	80	RARS, Jessore
42	Technology Transfer of BARI	2 days	70	OFRD, Barisal
43	Technology Transfer of BARI	2 days	70	OFRD, Barisal
44	Technology Transfer of BARI	2 days	60	RARS, Hathazari, Chitt.
45	Technology Transfer of BARI	2 days	60	RARS, Hathazari, Chitt.
46	Technology Transfer of BARI	1 batch	30	OFRD, Comilla
47	Technology Transfer of BARI	1 batch	35	OFRD, Sylhet
48	Technology Transfer of BARI	1 batch	35	RARS, Khaghrachari
49	Sustainable Technologies in Cotton Cultivation under Changing Climate	6 days	25	CDB, HQ/Sreepur
50	Sustainable Technologies in Cotton Cultivation under Changing Climate	6 days	25	CDB, HQ/Sreepur
51	Cotton Fiber Quality Improvement Technology	6 days	25	CDB, HQ/Sreepur
52	Cotton Fiber Quality Improvement Technology	6 days	25	CDB, HQ/Sreepur
		Total	**2217**	

Seminar/Workshop (NATP)

During the reporting period 12 events of national seminars/workshops in various fields of agriculture were organized with the support of the concerned divisions of BARC and NARS. In the seminars/ workshops 752 participants were present from the NARS institutes viz. BARI, BRRI, BJRI, BINA, BFRI (Fisheries), BFRI (Forest), BSRI, BLRI, BTRI, SRDI including BARC.

Implementation Status of local Seminar/Workshop under PIU-BARC, NATP: Phase-1 in 2012-2013.

Sl. No	Name of seminar/workshop	Date	No. of Part.	Venue
1.	Prospects of Horticultural Crop Production in Sylhet Region	06 Nov 2012	50	Sylhet Ag. Univ.
2.	Review Workshop on SPGR Sub-projects under Fisheries	29 Nov 2012	60	BARC Con. Room-1
3.	Environmental & Social Safeguard Implementation Review Workshop	13 Nov 2012	45	BARC Con. Room-1
4.	Review Workshop on M&E activities in the NARS	20 Nov 2012	60	BARC Con. Room-1
5.	ICT Application for Agricultural Planning and Development	14 Jan 2013	60	BARC Con. Room-1
6.	Progrress Review Workshop on SPGR Livestock Sub-project	29 Jan 2013	52	BARC Con. Room-1
7	Digital Revolution in Agriculture	27 Jan 2013	65	BARC Con. Room-1
8	Selection of Suitable Agricultural Technology for Southern Region of Bangladesh	18 Mar 2013	75	BARC Con. Room-1
9	Sugar Crops Research in Bangladesh: Present Status and Future Strategies	06 May 2013	70	BARC Con. Room-1
10	Monitoring of SPGR Sub-projects	19 May '13	100	BARC Con. Room-1
11	Workshop on BARI Technology Village (BTV) for technology dissemination	05 Jun 2013	65	BARI Con. Room-1
12	Problems and Prospects of upland cotton cultivation in hilly areas	19-20 Jun '13	50	CDB Training Hall, Khamarbari, Dhaka
			752	

Special Programs

A) An opinion exchange meeting was held at BARC Conference Hall on January 31, 2013 between Dr. Arvinda Kumar, the Deputy Director General (Education), Indian Council for Agricultural Research (ICAR), New Delhi, India and the senior level officers/scientist of BARC. The meeting was presided over by Dr. Wais Kabir, Executive Chairman, BARC. The meeting discussed the National Agricultural Research System in India and the potentialities of higher education for the NARS scientists of Bangladesh in the Indian Agricultural Universities.

B) A seminar on "ICT Applications for Agricultural Planning and Development" was held at BARC Conference Hall on January 14, 2013. Mr. Walter Mayer, General Manager Attachment of PROGIS Software GmbH, Austria made a power-point presentation. It may be mentioned that PROGIS Software GmbH is an expertise organization for manufacturing GIS soft-ware and ICT tools for agriculture. Some 40 concerned officers/scientists attended the program.

C) An Opinion Exchange Meeting was held on 10 October, 2012 at the Conference Room, BARC, Farmgate, Dhaka between Hunan Agriculture University delegation members from China and the Officers of BARC. The meeting was presided over by Dr. Wais Kabir. Executive Chairman, BARC. The meeting discussed opportunities of higher education for the NARS scientists in the universities of China.

D) An opinion exchange meeting was held at BARC Conference Hall on March 4, 2013 between a four-member delegation led by Dr. Humoud Bin Darwish Abbsani, Director of Research Centre of Plant Protection, Ministry of Agriculture and Fisheries, Sultanate of Oman and the senior NARS scientists. Presided over by Dr. Wais Kabir, Executive Chairman of BARC, the meeting discussed the potentialities of bilateral cooperation especially in the field of livestock and fisheries between the two countries.

E) A workshop titled "Digital Revolution in Agriculture" was held at BARC Conference Hall at 2.30 pm on January 27, 2013. Dr. David Bergvinson, Senior Program Leader (Science and Technology), Bill & Melinda Gates Foundation (BMGF), USA

made a power-point presentation on the above subject and discussed his ideas about the use of ICT in agriculture. Some fifty concerned participants from NARS, SAC and MoA attended the workshop.

F) A two-day workshop on IRRI-Bangladesh Rice Research and Development Strategy for the next ten years was held at BARC Conference Room-1 during 21-22 April 2013. The purpose of this workshop was to jot down the thoughts and ideas from the senior policy makers and senior research managers for framing the vision, mission and objectives of the above-mentioned Strategy. IRRI's Deputy Director General Dr. Achim Dobermann also attended the event.

Visit Abraod

Planning and Evaluation

- Dr. Paresh Chandra Golder, MD and Dr. Md. Abdus Salam, PSO attended a 5 dary Review workshop on Climate Adaption Livelihood Project Project (CLAP) in GIZ, Khatmondu, Nepal in 2013.
- Dr. Md. Abdul Awal, PSO attended 30 days program on Agricultural Project Planning , Monitoring and Evaluation Chiang Mai University Chiang Mai,Thailand in 2013.
- Dr. Md. Abdul Awal, PSO undertook Post Doctoral Study, Cornell University, USA (7 Months) in 2013.
- Dr. Md. Abdus Salam, PSO attended a 5 day Training Workshop on launch of CRAFT: CCAFS's Regional Agricultural Forecasting Toolkit, New Delhi, India in 2013.

Forestry, NRM

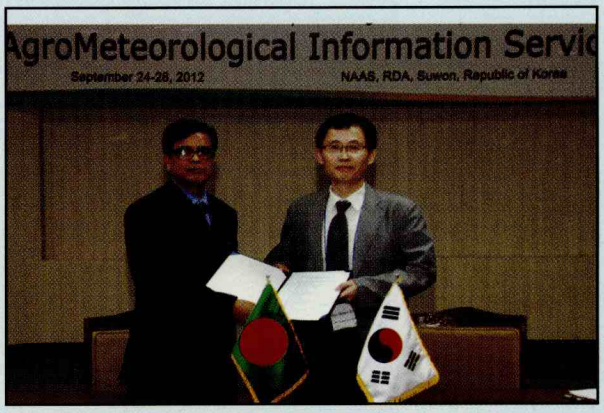
Participated in a training course on *Molecular Techniques in Diagnosis of Diseases of Farm Animals and Poultry* held in India at High Security Animal Disease Laboratory (HSADL), IVRI, Bhopal, from 22 April to 1st May, 2013.

Agricultual Engineering, NRM

- Dr. Sultan Ahmmed, Chief Scientific Officer attended in a Seminar on *Disaster management of damaged irrigation and water management facilities for agriculture* in Japan during 28 Nov-08 December 2012(11 days) with JICA funding.
- Dr. Sultan Ahmmed, Chief Scientific Officer and Dr. Nazmun Nahar Karim, Principal Scientific Officer visited Thailand during 1-5 May 2013 (5 Days) with CIMMYT & IDE funding.

Soils, NRM

- Training on "Agricultural Research Management" held on 28 July- 26 August 2012 at Chiang Mai University, Chiang Mai, Thailand.
- Attained in the workshop arranged by AFACI and presented a paper entitled "Production and Services of Agro-metrological Information for the Adaptation to Climate Change in Bangladesh" on 24-28 September, 2012 Suwon, South Korea.
- Attained in the 13th International Symposium for Soil and Plant Analysis and presented a paper entitled "Effects of Pressmud Compost Enriched with *Trichoderma* sp. and Chemical Fertilizer on Soil Fertility and Productivity of Sugarcane" held on 08-12 April 2013 at Queenstown, New Zealand.



Dr. S M Bokhtiar, CSO (Addl. Charge) signed Technical Cooperation Project (TCP) at PI meeting

Computer and GIS Unit

- Expert workshop of AFACI Pan-Asian Project for the *Establishment of Agricultural Technology Information Network in Asia (ATIN)*, 5 (Five) days 25-30 Nov 2012 in Sri Lanka. Funded by AFACI Pan-Asia "Establishment of Agricultural Technology Information Network in Asia (ATIN)" Project
- *Kick-Off Workshop of* Agricultural Model Intercomparison and Improvement *(AgMIP), South Asia, 5* (Five) days, 12-16 Nov 2012 in Sri Lanka. Funded by ICRISAT and AgMIP, Columbia University Center for Climate Systems Research.
- *IGB Boot Camp Meeting of* Agricultural Model Intercomparison and Improvement *(AgMIP)*, 5 (Five) days, 24 June-28 June 2013 in India. Funded by Agricultural Model Intercomparison and Improvement (AgMIP)
- *Training on Web Programming, Database Design and Networking*, 23 (Twenty Three) days, 19 Nov-12 Dec 2012 in Malaysia. Funded by PCU, NATP, Phase-1.

III. AGRICULTURAL INFORMATION AND PUBLIC RELATIONS

AGRICULTURAL INFORMATION

BARC devotes considerable efforts and resources for the development of an outstanding library collection to meet the expanding needs of agricultural research and to serve as an information resource centre for NARS institutes.

Development of Collection

The library has a total collection of about 22,900 information materials, which includes books, reports, pamphlets and bound journals etc. The following information materials have been procured during the period under report:

Items	Quantity
Books and Reports	159
Current Journals/Newsletter	78

Literature Search

The Centre renders literature search services from full-text database - The Essential Electronic Agricultural Library (TEEAL) CD database to satisfy the researchers, agricultural scientists, planners and policy-makers. It also provides search services on specific requests received form teachers, students and users from NARS institutes and other organizations. The library provided search service from TEEAL to 151 external users.

Services and Users

During this period 741 users of different categories have used the library. Besides the BARC and NARS scientists, teachers and students of Universities, NGO and private organizational personnel are the users of this library.

Update and Maintenance of databases

Database on Books and Reports contains 5,709 records out of which 159 records have been added during this year

- Database on Journals, Newsletters, and Periodicals contains 1110 records and being updated regularly.

News Clipping Services

Five hundred ninety nine articles (Bangla and English) have been identified, processed in different format, compiled and prepared a content list and preserved in the library for users.

Online Archive of Important Documents

Developed a database driven online archive based on Content Management Systems (CMS). The database contains digital contents of non-conventional documents of high archival value (Policy documents, Reports of all kinds, Proceedings and other mimeographs). The databse contains full text information of about 920 recods.

Resource Sharing

The library also performs resource sharing activities to serve the scientists. In this period, the library has collected information materials from FAO, BBS, BANSDOC and all NARS institutes.

AIC also has taken photographs of 40 workshops/ training/seminars/meetings and supplied 2063 photos in digital form to the concerned divisions and provided 1,05,298 photocopies of official documents, reports, letters, scientific literature etc. under 4,789 requests.

Activities Relating to BJA

During this period 20 articles have been received from the authors for publishing in the Bangladesh Journal of Agriculture (BJA). The articles have been processed following selecting reviewer/over viewer and making comparison of articles received from reviewers/ overviewer after correction made by the authors.

PUBLICATIONS

1. Afroz, Dil and Kamal, Md. Rafique Mostafa. 2014. Plant Varieties Developed by the NARS Institutes and Agricultural Universities of Bangladesh. Dhaka, BARC. 240p.
2. Bangladesh Journal of Agriculture, Vol. 37(2).
3. FRG. 2012. Fertilizer Recommendation Guide, Bangladesh Agricultural Research Council (BARC), Farmgate, Dhaka 1215.274p.
4. মাংস ও দুধ পরিবহন ও বিপণনে খাদ্যমান রক্ষা এবং স্বাস্থ্য ঝুঁকি নিয়ন্ত্রণ কৌশল ।

5. মাছের ক্ষতিকারক ফরমালিনের ব্যবহার ও প্রতিকারের উপায়।

6. মাছে ফরমালিন ও শুটকি মাছে কীটনাশক ব্যবহার প্রতিকার

Preparation/Presentation/Publication of Research Articles/Papers

Planning & Evaluation

- P.C. Golder, R.K. Sastry and K. Srinivas. 2013. Research priorities in Bangladesh: Analysis of Crop production trends. SAARC J. Agri.11 (1):53-70.
- Salam, M.A., M.A. Awal and P.C. Golder. 2012. Proceedings of the workshop on progress of annual work plan 2011-12 and proposed annual work plan 2012-13. Planning and Evaluation Division, BARC, Farmgate, Dhaka-1215.
- Awal, M.A. and M. A. Salam. 2012. Report on Field Monitoring Workshop on SPGR Sub-Projects-2012.Planning and Evaluation Division, ARC, Farmgate, Dhaka-1215.

Fisheries

- Four posters and one leaflet on addressing climate change in fisheries sector were published and disseminated during fish week
- Published Climate vulnerability and Capacity assessment (CVCA) reports for four upazila
- One paper titled, "*Approaches to optimizing dietary protein to energy ratio in stigning catfish*" was published in Bangladesh Journal of Agriculture, BARC.

Livestock

- Ahsan, M.M., Khan, M.F.R., Rahman, M.B., Hassan, J., Chowdhury, S.M.Z.H., Parvej, M.S., Jahan, M., Nazir, K.H.M.N.H. (2013). Investigation into *Bacillus anthracis* Spore in Soil and Analysis of Environmental Parameters Related to Repeated Anthrax Outbreak in Sirajganj, Bangladesh. Thai Journal of Veterinary Medicine, 43(3): 449-454.
- Chowdhury, S.M.Z.H. and Ahmmed, S. (2012). Report on the progress of Implementation of the Annual Work Plan 2011-2012 and Annual Work plan 2012-2013. Livestock Division, BARC, Farmgate, Dhaka, July 2012.
- Chowdhury, S.M.Z.H. and Basher, M.K. (2013). Annual Report 2011-2012. Livestock Division, BARC, Farmgate, Dhaka, April, 2013.
- Hassan, A.A., Chowdhury, S.M.Z.H. and Morshed, R.M. (2013). Field monitoring of SPGR sub-project. Monitoring Team- 2, BARC, Farmgate, Dhaka, May 2013.
- Chowdhury, S.M.Z.H., Aminuzzaman, M. and Haque, K.I. (2013). Field Monitoring of Research Projects (2012-13) under "Research Grant"of BARC. Monitoring Team- 4, BARC, Farmgate, Dhaka, June 2013.
- Chowdhury, S.M.Z.H. and Taimur, M.J.F.A. (2013). A Manual on Peste des Petits Ruminants (PPR), 2nd edition, published by Livestock Division, BARC, Farmgate, Dhaka-1215.

Soils, NRM

Bokhtiar, S. M., M. A., Hassan A. A., and Hossain, M.B. (eds.), 2013. Proceedings of Research Review and Planning Workshop on Soils Program of NARS Institutes, 2012 held during 4-6 September 2012 at BARC, Farmgate, Dhaka.

Soils, Forestry

- Proceedings on Bamboo Production and Utilization Workshop.
- Manual on Training on Agroforestry Technology.
- Proceedings on Agroforestry Practices in Newly Accreted Charland of Bangladesh.

AERS

- A.S.M. Anwarul Huq and Md. Ferdous Alam. 2012. *"Marketing System of Agricultural Products in Bangladesh"*. Chapter 14. In the book *"Agricultural Marketing Issues of Selected Commodities"* – Edited by Fatima Mohamed Arshad, Md. Ferdous Alam and Amin Mahir Abdullah. Universiti Putra Malaysia Press 2012. ISBN 978-967-344-325-2.
- Md. Ferdous Alam and A.S.M. Anwarul Huq. 2012. *"Fish Marketing System in Bangladesh"*. Chapter 15. In the book *"Agricultural Marketing Issues of Selected Commodities"* – Edited by Fatima Mohamed Arshad, Md. Ferdous Alam and Amin Mahir Abdullah. Universiti Putra Malaysia Press 2012. ISBN 978-967-344-325-2.

TTMU

- Proceedings: Core Monitoring Workshop, BARC, 2013.
- Training Manual: 1.BSRI, 2.BSRTI, 3.BFRI, 4.BINA, 5.BJRI, 6.BRRI 7. BARI, 8.BLRI
- Report: 1. Monitoring Report, 2.Annual Report: 2012-13, 3. Progress 2012-13 and Work plan 2013-14 Report 4.

IV. ADMINISTRATION AND FINANCE

ADMINISTRATION

Governing Body Meeting

The first meeting of the Governing Body was hsld on 27 Februaty 2013 in the BARC conference room. The meeting directed to explicitly describe the achievements attained by Sponsored Public Goods Research (SPGR) sub-projects so that it gives a clear idea about how the achievements are going to improve the agriculture and the farmers in the country. The meeting expressed satisfaction on the development of digital crop zoning and emphasized on updating it after every five years. The meeting also discussed the enhancement of honourarium of PhD scholars and other allownces for Governing Body, Executive Council, Board of Management of NARS institutes, and seminar/meeting etc.

A View of Governing Body Meeting.

Executive Council Meeting

The 2nd, 3rd, 4th, 5th, 6th and 7th meetings of Executive Council of BARC were held on 1st August, 7th October and 23rd December of 2012 and 27 February, 11 April and 6th June of 2013 respectively in the BARC conference room. The 2nd meeting discussed the equalization of grading system with the erstwhile class/division system of grading. The meeting formed a Committee to submit a report along with the recommendations. The 3rd meeting discussed the research proposals and budget of Bangladesh Sericultural Research and Training Institutes and Cotton Development Board for approval. It also discussed the matter relating to allowances of training, meeting, rapporteur and and expert reviewers of NARS institutes. The 4th meeting discussed the proposals and budget of research programmes of BARI and BINA, the *Guidelines of Allocation and Management of BARC Research Grants-2013.* The meeting also discussed allowances of training/seminar/workshop participants, guest speaker, farmetrs, course director and coordinator, session chair, rapporteur, key-note speakers, etc. The Executive Chairman, BARC mentioned the importance of Master Plan for determining future research palan and research priorites. The 6th meeting approved the research porposals and budget of BRRI and discussed the matter relating to enhancement of institutional capacity, operalization of M&E Cell and MIS database. As per the decision of 2nd meeting, the 6th meeting presented the revised report on equalization of grade with previously class/division system. The 7th meeting discussed and approved the research proposals and budget of BJRI, BLRI, BFRI (Fisheries) and BFRI. The meeting also approved the appointment and promotion of BARC officers.

Promotion/Appointment

During the period the following officers have been promoted to the positions mentioned against name:

Promotion Committee 1: 01/08/2012

1. Dr. Md. Aziz Zilani Chowdhury, Chief Scientific Officer (Crops)
2. Dr. Md. AbulKashem, Director (TTMU)

Promotion Committee 2:27/02/2013

1. Md. Rafique Mostafa Kamal, Principal Documentation Officer, AIC
2. Md. Abdul Mottakin, Deputy Director, Budget.
3. Muhammad Mahbubul Hassan, Senior Assistant Director, Establishement

Appointment Committee-2: 19/02/2013

1. Dr. Abdus Salam, Principal Scientific Officer (Planning and Evaluation)
2. Dr.Nazmun Nahar Karim, Principal Scientific Officer (Agricultural Engineering)
3. Dr. M. Baktear Hossain, Principal Scientific Officer (Soils)

Miscellaneous

Trainings have been provided to the 3rd and 4th class employees including Driver on Office discipline. Effort has been made to fill up the vacant positions of BARC through promotion and appointment. Attempt has also been made for Amendment of BARC Service Rule.

FINANCE

Introduction

Bangladesh Agricultural Research Council receives funds from Development and Revenue Budgets of the to conduct its annual mandate activities like Research management, Coordination, monitoring, Evaluation, Technology transfer and manpower development and improvement of the production of Rice, pulse, etc. In this respect BARC's Finance Division prepares the MTBF budget and financial plan of medium term activities and accordingly disburses fund for achievement of the goal. It keeps all the record of expenditure incurred during the year and reports to the Ministries, CAO, IMED, Development Partner and other Govt. Offices properly. It also reconciles the Accounts with CAO to prepare the final Accounts which is submitted before the Public Accounts Committee (PAC) of the National Assembly.

Budgeting and Expenditure Control

The Govt. has implemented *Medium Term Budgetary Framework (MTBF)* for some selected Ministries including Ministry of Agriculture and its Division, Bodies and Corporations since 2005-06. Accordingly BARC prepared budget in the form of MTBF for Revenue Head and Development Projects and submitted to the Ministry for approval. In this respect BARC has a Budget Committee headed by the Executive Chairman, BARC.

Revenue Budget: Fund Release/Disbursement

As per annual allocation of Budget of the Govt. BARC makes proposal for the release of fund from the Govt. on quarterly basis. In the Financial year 2012-2013 BARC received Tk. 1225.00 lakh for Salary and allowances, Core Research, Technology Transfer and manpower development and operational fund. To implement these activities funds were released to the Agricultural Research Institutes (ARI's) and associated organizations according to the budget plan. The overall statement of Expenditure for 2012-13 is shown below:

a) Revenue Budget

Sl.	Line item	FY 2012-13 (Tk. in lakh)	
		Budget	**Expenditure**
1.	Pay of Officer	190.00	180.00
2.	Pay of Staff	180.00	160.00
3.	Allowances	366.50	332.28
4.	Supply and Services:		
a.	Research Grant	140.00	140.00
b.	Manpower Development/ Training	62.00	55.00
c.	Utility	118.60	116.50
d.	Other operational	28.00	28.00
5.	Repair and Maintenance	32.00	31.50
6.	Leave Salary & Gratuity	80.00	70.00
7.	Capital Expenditure	66.00	66.00
	Total	**1261.10**	**1179.28**
8.	(-) Self Income	**6.00**	**5.00**
		1225.00	**1121.05**

b. Core-Research

BARC Implemented 35 no's of Core Research activity during the year under it's schedule Research Institute (SRI) and Associated organizations as per mandate of BARC. The financial progress of the Core Research are as follows:

Sl.	Name of Institute	No. of Core Research	Financial Progress
1.	Sylhet Agricultural University	2	8,79,400/-
2.	Sher-e-Bangla Agricultural University	2	7,22,000/-
3.	BAURES, Bangladesh Agricultural University	13	47,74,828/-
4.	Soil Recourse Development Institute (SRDI)	1	7,64,000/-
5.	Bangladesh Agricultural Research Institute (BARI	11	34,36,832/-
6.	Bangladesh Institute of Nuclear Agriculture (BINA)	3	9,89,400/-
7.	Bangladesh Jute Research Institute (BJRI)	1	3,50,000/-
8.	Patutakhali Science & Technology University	1	3,00,000/-
9.	Hazi Danesh Science & Technology University, Dhaka	1	2,85,000/-
12.	Bangladesh Agricultural Research Council (BARC)		9,45,14,922/-
	Total=	**35**	**10,70,16,382/-**

Development

(a) Sub-SPGR

National Agricultural Technology project (NATP) is a world Bank/IFAD funded project implemented by Project Co-ordination Unit (PCU), Sponsored Public Good Research (SPGR) of Agricultural Research support component under NATP is being implemented by BARC Project implementation Unit (PIU). BARC Head Quarter undertook 14 sub-Project under Sponsored Public Good Research (SPGR) for the financial year 2012-2013 for Research, Adopting Research, extension activities, Enhancing Research capacity, Farm Productivity, Assigning Cropping pattern, Fertilizer Management, Pest Management, Arsenic Management, development of Management efficiency including policy Planning. During the Financial Year 2012-2013 BARC implemented 14 sub SPGR project. Comprehensive Expenditure are summarized below:-

(Taka in lakh)

Sl.	Sub-SPGR	Salary & Remu.	Research Expenses	Opt. Exp.	Fuel Oil Main	Trn/Work Shop/Seminar	Publication/ Printing	Contin-gencies	Capital Exp.
1	Soil Fertility……cropping pattern (SFFMP)	9.90	0	0.52	0.24	2.49	0.38	0.64	0.25
2	Updating of Fertilizer ……. Generated by The NARS	1.31	0	5.00	0	0	0	0.42	0
3	Coordinated Project on Arsenic……plant System	0.26	0	0.27	0	0.70	0	8.50	0
4	Contaminants and adulterants in Food chain and their migration	7.55	0.48	1.06	1.80	4.53	0.16	1.41	0
5	Carban Sequestration in Soils of Bangladesh	0.32	0.04	0.13	0.10	0.82	0	0.01	0
6	Assessment of Land ……. surface water in coastal area	0.36	0	0.80	0.38	1.50	0	0.03	1.79
7	Water Mgt. for ……. Changing climate	10.03	0	0.80	0.38	1.50	0	0.03	1.79
8	Improvement of Agro Forestry ……. Live hood & Environ.	10.62	0	3.52	0.97	3.46	0	0.99	0.98
9	Development and up scaling ……. Vegetable Crops	13.42	0	2.40	0.27	0.13	0	0.27	0
10	Coordinated sub project on ……. Genetic Resources	7.15	0	0.52	0.15	0.52	0	0.79	5.77
11	Coordinated sub project on ……. Farmers live hood Imp.	12.81	0	1.46	1.80	3.26	0	1.97	10.77
12	Coordinated sub project on ……. Aqua Ecosystems Bd.	18.33	39.98	1.74	2.00	5.30	0	1.76	0.79
13	Surveillance of important …… Livestock & Poultry of BD	4.90	0.05	2.24	0.16	1.70	0.39	0.28	1.05
14	Application of GIS ……. Cropping pattern of BD	0.61	0.42	2.09	1.21	0.52	0.24	1.06	33.39

(b) AFACI Project Expenditure

Sl.	Project Name	Local travel	Progrm. planing	Supp-orting Staff	Workshop	Tech. allowance	Publication	Statio-naries	Foreign visit
1.	Collection, characterization and …… chilli in Bangladesh	0.00	0.19	0.00	0.00	0.00	0.00	0.48	13.97

Sl.	Project Name	AFACI Off. Visit	Unseen Expendi-ture	Workshop	Coordination Meeting	Training & Publication	Computer/ Multimedia/ Camera	Air Conditioner	Photo-copy machine	Stationaries
1.	Development of Variety, Cropping ……..Bangladesh under AFACI	0.30	0.30	1.39	0.34	2.46	0.24	1.0	0.00	1.02

Sl.	Project Name	Meeting (Overseas)	Local travel	Printing publication	Manual devel.	Stationaries	Workshop	Miscellaneous
1.	Establishment of network ……. Horticultural crops in Bangladesh.	1.70	0.18	0.00	1.67	0.18	0.91	0.02
2.	Development of Locally-Appropriate GAP …… Safety Information System.	2.98	0.33	0.00	1.75	0.13	1.07	0.02

Accounting

Maintain its accounts following standard accounting system. It keeps a well-printed Cash Book, Ledger, Advance Register, Budget Control Register and other related ledger to record all transaction during the year accurately.

GoB Audit

During the year 2012-13 GOB local audit did not performed audit of all Accounts, Bills, Vouchers and other related records of BARC Revenue budget. GOB local audit department verbally conformed us they will conduct audit of 2 FY i.e. FY 2011-12 and 2012-13 at a time.

Settlement of audit objection

During the year 2012-13 a remarkable number of audit objection has been settled are appended below:

Sl. No.	Particular	No.	Settled audit objection
1.	Revenue	8	10,57,314.00
2.	Development	9	1,87,33,329.00
	Total :	**17**	**1,97,90,643.00**

Reporting

BARC Finance section keeps all the record of expenditure incurred during the year and reports to the Ministry, IMED, CAO, Development Partner and other Government offices Monthly, Quarterly, Half yearly and Annually.

Reconciliation

It also reconcile the Accounts with CAO to prepare the Final Accounts which is submitted before the Public Accounts Committee (PAC) of the National Assembly.

Retirement benefits

During the year 2012-13 retirement benefits and CPF Payment made to the Officer's and Staff of BARC are shown below:

- CPF Final payment:Officer's(1):Tk. 22,91,000.00; Staff (2): Tk. 15,04,637.00; Total 22,39,931.00.
- Gratuity payment: Officer's (1): Tk. 22,91,000.00; Staff(4): Tk. 29,88,474.00 Total Tk. 52,79,474.00.
- Leave Salary payment: Leave Encashment allowed to 5 staff amounting a Tk. 6,15,240.00.
- CPF Loan: CPF loan given to the 8 Officer's (Tk. 19,40,000.00 and 69 Staff (Tk. 1,03,72,500) during the year and Taka 38,76,470.00 has been recovered against the previous sanctioned loan.

Group Insurance

BARC undertook Group Insurance for well being of its Officers and Staff for any unavoidable incident with Jiban Bima Corporation since 36 years. We mourn lost of our One colleague i) Late Haider Ali, Driver during the year. We received an amount of Tk.2,55,720/- as compensation under Group Insurance from Jiban Bima Corporation for the aforesaid deceased and payment made to their nominee.

Professional Staff

Office of the Executive Chairman

Wais Kabir, PhD, Executive Chairman
Md. Hussyam UddinParvez, PS to Executive Chairman

Crops Division

Md. Khalequzzaman Akanda Chowdhury, PhD, Member Director
Abul Kalam Azad, PhD, Chief Scientific Officer
Md. Aziz Zilani Chowdhury, PhD, Chief Scientific Officer
S.M. Khorshed Alam, PhD, Principal Scientific Officer
Mian Sayeed Hassan, PhD, Principal Scientific Officer

Planning and Evaluation Division

Paresh Chandra Golder, PhD, Member Director (Current Charge) & Chief Scientific Officer
Md. Abdul Awal, PhD, Principal Scientific Officer
Md. Abdus Salam, PhD, Principal Scientific Officer

Natural Resources Management Division

Ahmad Ali Hassan, PhD, Member Director
Sultan Ahmmed, PhD, Chief Scientific Officer (Agricultural Engineering)
Mohammad Shahjahan, PhD, Chief Scientific Officer (Forestry)
Md. Abdus Satter, PhD, Chief Scientific Officer (Soils)
Shaikh Mohammad Bokhtiar, PhD, Principal Scientific Officer (Soils)
Md. Baktear Hossain, PhD, Principal Scientific Officer (Soils)
Dr. Nazmun Nahar Karim, PhD, Principal Scientific Officer (Ag.Engg.)

Fisheries Division

Md. Kabir Ikramul Haque, PhD, Member Director (Current Charge) & Chief Scientific Officer

Nutrition Unit

Md. Monirul Islam, PhD, Director

Livestock Division

Md. Khairul Basher, Member Director
Shah Md. Ziqrul Haq Chowdhury, PhD, Chief Scientific Officer

Agricultural Economics and Rural Sociology Division

S M Khalilur Rahman, PhD, Member Director
A.S.M. Anwarul Huq, PhD, Chief Scientific Officer

Technology Transfer Monitoring Unit

Md. Abul Kashem, PhD, Director
Fauzia Yasmin, PhD, Principal Scientific Officer

Agricultural Information Centre

Dil Afroz, Director
Md. Rafique Mostafa Kamal, Principal Documentation Officer
Shah Md Monir Hossain, Senior Scientific Editor
Afroza Anjum, Senior Reprographic Officer (CC)
Susmita Das, Senior Documentation Officer (CC)
Md. Alamgir, Graphic Designer, CC

Computer and GIS Unit

Md. Abeed Hossain Chowdhury, Director
Hasan Md. Hamidur Rahman, Senior System Analyst
Md. Shohid Uddin Bhuiyan, System Analyst
Md. Abdul Mabin, Programmer
Mihir Kanti Sarker, Data Entry Officer
Md. Ayub Hossain, Data Entry Officer

Manpower and Training Unit

M. Aminuzzaman, Director (Current Charge)
Md. Mustafizur Rahman, Principal Training Officer (Addl. Charge)

Administration and Finance Division

Meraz Uddin Ahmed, PhD, Member Director

Support Service Unit

Md. Monirul Islam, PhD, Director (Addl. Charge)
Md. Jashim Uddin Chowdhury, Deputy Director (Establishment)
Md. Mahbubul Hassan, Senior Assistant Director (Establishment)
Md. Akbar Ali Shaikh, Assistant Director (Store)
M Nazim Uddin, Senior Assistant Director (Proc), CC
Md. Ershad Ali, Executive Engineer, CC
Md. Rafiqul Islam, Assistant Director (CS)
Md. Nasir Uddin, Assistant Director (Store)

Finance Unit

Md. Mozibar Rahman, Director
Ajit Kumar Chakraborty, Deputy Director (Accounts)
Md. Abdul Mottakin, Deputy Director (Audit)
Md. Abdur Rob Shaikh, Senior Assistant Director (Budget), CC
Md. Daloar Hossain, Senior Assistant Director (Accounts)
Md. Lokman Hossin, Assistant Director (Audit), CC

THE GOVERNING BODY

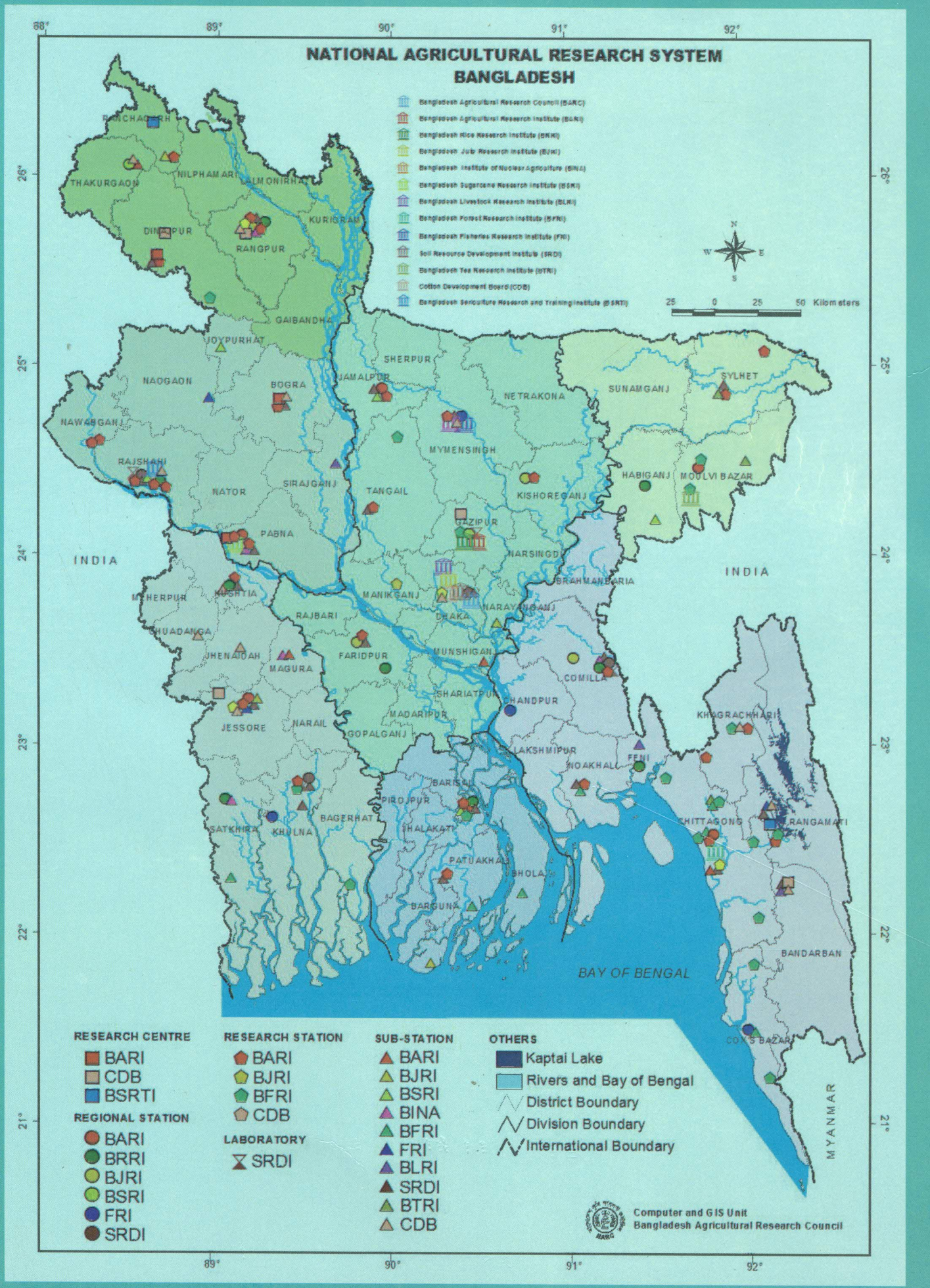
BANGLADESH AGRICULTURAL RESEARCH COUNCIL

1	Honorable Minister for Agriculture	Chairman
2	Honorable Minister for Fisheries and Livestock	Co-Chairman
3	Honorable Minister for Environment and Forests	Co-Chairman
4	Mr. Nazmul Hasan, Parliament Member, Kishoregonj-6	Member
5	Mr. Abdul Mannan, Parliament Member, Parliament Member, Bogra-1	Member
6	Secretary, Ministry of Agriculture	Member
7	Secretary, Ministry of Fisheries and Livestock	Member
8	Secretary, Ministry of Environment and Forests	Member
9	Member (Agriculture), Planning Commission	Member
10	Vice Chancellor, Bangladesh Agricultural University	Member
11	Chairman, Bangladesh Agricultural Development Corporation	Member
12	Executive Chairman, Bangladesh Agricultural Research Council	Member
13	Director General, Department of Agricultural Extension	Member
14	Director General, Bangladesh Agricultural Research Institite	Member
15	Director General, Bangladesh Rice Research Institite	Member
16	Director General, Bangladesh Jute Research Institite	Member
17	Director General, Bangladesh Institute of Nuclear Agriculture	Member
18	Director General, Bangladesh Sugarcane Research Institite	Member
19	Director General, Department of Livestock Services	Member
20	Director General, Department of Fisheries	Member
21	Joint Secretary, Finance Division, Ministry of Finance	Member
22	Joint Secretary (Discipline and Law), Ministry of Public Administration	Member
23	Chief Conservator of Forests, Bangladesh Forest Department	Member
24	Dr. M.A. Hamid Miah, Liaison Scientist, IRRI Bangladesh, House#9, Road#2/2, Banani, Dhaka	Member
25	Dr. Qazi Kholiquzzaman Ahmad, Chairman, Palli Karma-Sahayak Foundation, PKSF Bhaban, Plot-E, 4/B, Agargaon, Dhaka	Member
26	Professor Dr. M. Nurul Islam, BUET, Flat-7, Minakkhi Apartment, House#27, Road# 12A (New), Dhanmandi, Dhaka	Member
27	Mr. Motahar Hossain Mollah, President, Bangladesh Krishok League, Kapasia, Gazipur	Member
28	Mr. A.K.M. Azad, Proprietor, A.M. Traders, Globe Center, 28/1 Indira Road, Farmgate, Dhaka	Member
29	Dr. Mahabub Hossain, Adviser to Executive Director, Bangladesh Rural Advancement Committee, BRAC Center, 75, Mohakhali, Dhaka	Member
30	Dr. Miraz Uddin Ahmed, Member Director(A&F), BARC	Member Secretary

THE EXECUTIVE COUNCIL

BANGLADESH AGRICULTURAL RESEARCH COUNCIL

1.	Executive Chairman, Bangladesh Agricultural Research Council, Dhaka	Chairman
2.	Director General, Bangladesh Agricultural Research Instiute, Gazipur	Member
3.	Director General, Bangladesh Rice Research Instiute, Gazipur	Member
4.	Director General, Bangladesh Jute Research Instiute, Dhaka	Member
5.	Director General, Bangladesh Instiute of Nuclear Institute, Mymensing	Member
6.	Director General, Bangladesh Sugarcane Research Instiute, Ishurdi, Pabna	Member
7.	Director General, Bangladesh Livestock Research Instiute, Savar, Dhaka	Member
8.	Director General, Bangladesh Fisheries Research Instiutem Mymensingh	Member
9.	Director, Bangladesh Tea Research Instiute, Srimongal, Moulvibazar	Member
10.	Director, Bangladesh Agricultural Research Instiute, Chittagong	Member
11.	Director, Soil Resource Development Institute, Dhaka	Member
12	Director, Bangladesh Sericulture Research and Training Institute, Rajshahi	Member
13	Executive Director, Cotton Development Board, Dhaka	Member
14	Executive Director, Krishi Gobeshona Foundation, Dhaka	Member
15.	Member Director (Crops), BARC	Member
16.	Member Director (Planning and Evaluation), BARC	Member
17.	Member Director (Natural Resources Management), BARC	Member
18.	Member Director (Agricultural Economics and Rural Sociology), BARC	Member
19.	Member Director (Livestock), BARC	Member
20.	Member Director (Fisheries), BARC	Member
21.	Member Director (Administration and Finance), BARC	Member


NATIONAL AGRICULTURAL RESEARCH SYSTEM
BANGLADESH
Bangladesh Agricultural Research Council (BARC)
Bangladesh Agricultural Research Institute (BARI)
Bangladesh Rice Research Institute (BRRI)
Bangladesh Jute Research Institute (BJRI)
Bangladesh Institute of Nuclear Agriculture (BINA)
Bangladesh Sugarcane Research Institute (BSRI)
Bangladesh Livestock Research Institute (BLRI)
Bangladesh Forest Research Institute (BFRI)
Bangladesh Fisheries Research Institute (FRI)
Soil Resource Development Institute (SRDI)
Bangladesh Tea Research Institute (BTRI)
Cotton Development Board (CDB)
Bangladesh Sericulture Research and Training Institute (BSRTI)
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BOGRA
SHERPUR
JAMALPUR
NETRAKONA
SUNAMGANJ
SYLHET
NAWABGANJ
RAJSHAHI
NATOR
SIRAJGANJ
TANGAIL
MYMENSINGH
HABIGANJ
MOULVI BAZAR
KISHOREGANJ
PABNA
GAZIPUR
NARSINGDI
INDIA
INDIA
MEHERPUR
KUSHTIA
MANIKGANJ
BRAHMANBARIA
RAJBARI
DHAKA
NARAYANGANJ
CHUADANGA
JHENAIDAH
MAGURA
FARIDPUR
MUNSHIGANJ
COMILLA
SHARIATPUR
CHANDPUR
MADARIPUR
JESSORE
NARAIL
GOPALGANJ
KHAGRACHHARI
LAKSHMIPUR
NOAKHALI
FENI
BARISAL
PIROJPUR
BAGERHAT
SATKHIRA
KHULNA
JHALAKATI
CHITTAGONG
RANGAMATI
PATUAKHALI
BHOLA
BARGUNA
BANDARBAN
BAY OF BENGAL
COX'S BAZAR
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RESEARCH CENTRE
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SUB-STATION
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BSRI
BINA
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BTRI
CDB
OTHERS
Kaptai Lake
Rivers and Bay of Bengal
District Boundary
Division Boundary
International Boundary
Computer and GIS Unit
Bangladesh Agricultural Research Council